EXCEPTIONAL EVENTS IMPLEMENTATION WORKSHOP
OVERVIEW OF EXCEPTIONAL EVENTS RULE REVISIONS

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Exceptional Events Workshop
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Overview of Exceptional Events Rule Revisions

- Project scope
- Rule background
- Technical criteria: the finer points
- Demonstration development, submittal and review
- Mitigation

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Overview of Exceptional Events Rule Revisions
Project Scope

- The 2016 rule revisions and final wildfire/ozone guidance were needed first steps, but efficient and coordinated implementation is critical.
- What is next?
- Additional Implementation Guidance
  - Revisions to *Interim Exceptional Events Guidance Documents*
  - Stratospheric Ozone Intrusion Guidance
  - Alternate Paths for Data Exclusion Guidance
  - Prescribed Fire Guidance
- Continued development of exceptional events tools
  - Templates
  - Website updates
  - AQS modifications to reflect rule revisions
  - Standardized metrics and tracking
  - Targeted efforts with FLMs – communications and tools
- Other?

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Overview of Exceptional Events Rule Revisions
Rule Background

- New rule effective 9/30/16; published in Federal Register 10/3/16 (81 FR 68216)
- Applies to the treatment of data showing exceedances or violations of any NAAQS for purposes of the specific types of regulatory determinations by the Administrator:
- Affects Designations/Redesignations; Classifications; Attainment demonstrations (including clean data determinations); Attainment date extensions; Findings of SIP inadequacy leading to a SIP call
- Applies to all state air agencies, to (delegated) local air agencies, to tribal air agencies that operate air quality monitors that produce regulatory data and to federal land managers/federal agencies if agreed to by the state
- Other actions on a case-by-case basis

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Overview of Exceptional Events Rule Revisions
Technical Criteria: the finer points

- The event affected air quality in such a way that there exists a **clear causal relationship** between the specific event and the monitored exceedance or violation (as supported by a comparison of the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times)

- The event was a human activity that is unlikely to recur at a particular location or was a natural event.

- The event was not reasonably controllable or preventable

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Clear Causal Relationship

The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation

- May wish to consider addressing this element first
- Clear causal relationship element consists of the following:
  - Analyses to show that the event occurred
  - Analyses to show that emissions of the pollutant of interest were transported to the monitor(s) recording the exceedance
- Weight of evidence analysis

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Clear Causal Overview of Exceptional Events Rule Revisions
Technical Criteria: Clear Causal Relationship

The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation

- Analyses that the event occurred
  - Comparison to historical concentrations [50.14(c)(3)(iv)(C)]
    - May be sufficient to demonstrate that the event occurred
    - No cut-off or percentile that must be met or proven for historical concentrations.
    - Recommend using 5 years of data
    - Example analyses provided in preamble to final rule (see Table 2)
  - Other analyses as needed [50.14(c)(3)(iv)(B)

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Clear Causal Relationship

The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation

- Evidence of Transport to the Monitor
  - Speciation data at the monitor
  - Back/Forward Trajectories
  - Satellite imagery
  - Spatial extent maps comparing event days and non-event days

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Clear Causal Relationship

The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation

- Clear causal relationship considerations for natural events
  - Shows that the event was caused by non-anthropogenic sources
    - If anthropogenic contributors → need showing of reasonable controls showing
  - Criterion referenced in the not reasonably controllable or preventable section for natural events
  - Rule language as natural events:
    - Wildfires on wildland, stratospheric ozone intrusions
    - Volcanos (no specific regulatory language)

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Human Activity / Natural Event

The event was caused by human activity that is unlikely to recur at a particular location or was a natural event.

- Was the event natural or a human activity that is unlikely to recur?
  - Recognized natural events (81 FR 68232)
    - Wildfires, stratospheric ozone intrusions, volcanic and seismic activity, natural disasters, certain high wind dust events
    - Natural events can recur
  - Emissions do not have to be entirely without a human component. If anthropogenic sources contribute to the event and are reasonably controlled, then an air agency can make the case that these emissions play no direct causal role. 40 CFR 50.1(k). Thus, they can satisfy the definition of "natural events."

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Human Activity / Natural Event

The event was caused by human activity that is unlikely to recur at a particular location or was a natural event.

- Is this human activity unlikely to recur?
- Particular Location:
  - Can vary depending on the specifics of the area
  - Air agencies and regions should proactively discuss what a "particular location" means
- Event recurrence
  - Three events in 3 years benchmark: Has there been a similar event type generating emissions of the same pollutant (regardless of whether it was an exceptional event) within 3 years before the date of the event?
    - A single discrete event is one occurrence even if it extends over more than one day
    - An event that does not fit this recurrence benchmark may be approvable on a case-by-case basis.

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Not Reasonably Controllable or Preventable

The event was not reasonably controllable and the event was not reasonably preventable

- "Controllable" and "Preventable" are separate tests
- Not reasonably controllable?
  - Reasonable measures to control the impact of the event on air quality were applied at the time of the event
- Not reasonably preventable?
  - Reasonable measures to prevent the event were applied at the time of the event
- Case specific approach evaluated in light of information available as of the date of the event.

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Not Reasonably Controllable or Preventable

The event was not reasonably controllable and the event was not reasonably preventable

- Circumstances that do not require detailed analysis
  - (1) The emissions generating activity is beyond the jurisdictional boundaries of the state submitting the demonstration [50.14(b)(8)(vii)]
  - (2) the emissions generating activity is a natural event and all anthropogenic contributors are reasonably controlled
    - Wildfires on wildland [50.14(b)(5)(iv)]
    - Large-scale, high-energy high wind dust events [50.14(b)(5)(vi)]
    - Stratospheric ozone intrusions [50.14(b)(6)]
  - (3) Deference to measures in a nonattainment or maintenance SIP/FIP/TIP approved within 5 years of the date of the event [50.14(b)(8)(v)]
    - Does not apply if the air agency is under obligation to revise SIP
- If the event-type exclusion applies to the event emissions, then the not reasonably controllable or preventable section of the demonstration should include a statement explaining this point and cite to the rule presumption.

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Not Reasonably Controllable or Preventable

The event was not reasonably controllable and the event was not reasonably preventable

- Approach for event emissions without presumptions
  - (1) Identify the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance or violation, including the contribution from local sources
  - (2) identify the relevant SIP, FIP or TIP or other enforceable control measures in place for these sources and the implementation status of these controls
  - (3) provide evidence of effective implementation and enforcement of reasonable controls, if applicable

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Overview of Exceptional Events Rule Revisions Technical Criteria: High Wind Elements

- Provisions for high wind thresholds
  - EPA will accept 25 mph sustained winds threshold for listed Western States, provided…
  - Alternative area-specific high wind thresholds
- Provisions and criteria for large-scale and high energy high wind dust events
  - Generally consider demonstration sufficient documenting nature and extent of the event for the not reasonably controllable criterion provided State provides evidence showing:
    - Event is associated with dust storm and is the focus of a ‘‘Dust Storm Warning’’ by the NWS* and include NWS* observations of dust storms and blowing dust
    - Event has sustained wind speeds $\geq$ 40 mph, and has reduced visibility $\leq$ 0.5 miles
  - In addition, the event should generally be associated with measured exceedances occurring at multiple monitoring sites over a large geographic area, unless… **

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Fire-Related Rule Revisions

- Fire-related rule language and preamble text
  - Define fire-related terms in regulatory language
    - *Wildland* means an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.
    - *Prescribed Fire* is any fire intentionally ignited by management actions in accordance with applicable laws, policies, and regulations to meet specific land or resource management objectives.
    - *Wildfire* is any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.
  - Clarify that all wildfires on wildland are natural events
  - Clarify that prescribed fire on wildland is a human-caused event eligible for treatment as an exceptional event

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Fire-Related Rule Revisions

- Provisions for prescribed fires
  - Language in preamble recognizes the need for and benefits of prescribed fire
  - Applying rule criteria to prescribed fires
    - Clear causal relationship – analyses similar to those for wildfires (see guidance)
    - Human activity unlikely to recur – recurrence is either the natural fire return interval OR the fire frequency needed to establish, restore and/or maintain a sustainable and resilient wildland ecosystem (as documented in a land/resource management plan)
    - Not reasonably preventable – incorporates concept of "foregone benefits" and uses same approach as unlikely to recur
    - Not reasonably controllable – fire conducted under a certified and implemented Smoke Management Program (SMP, see preamble) or using basic smoke management practices (BSMP, see rule text)

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Fire-Related Rule Revisions

- Provisions for prescribed fires (cont'd)
  - Remove existing rule language requiring a state to re-consider adopting a SMP after each exceptional event
  - Require land managers, burn managers and air agencies to collaborate regarding the process by which the agencies will work together to include general expectations for selection and application of appropriate BSMP (2-year phase in period)
- Land/resource management plans and exceptional events
  - Can be relied upon to address recurrence and not reasonably preventable
  - Requirements apply equally to federal, public and private landowners

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Overview of Exceptional Events Rule Revisions
Technical Criteria: Fire-Related Rule Revisions

- Prescribed fire recurrence
  - Different for prescribed fire on wildland and other event types
  - Different for "unlikely to recur" and trigger for mitigation plan development
- Fire roles and responsibilities
  - Burn manager/agency can provide fire-specific information (e.g., emissions, acres burned, meteorology, modeling, communication and outreach, etc.)
  - Air agency and/or FLM can assess regulatory significance and the usefulness of getting EPA approval for data exclusion
  - Air agency and/or FLM can prepare the technical demonstration, which involves several data gathering and analysis tasks (EPA strongly encourages air agency and land manager collaboration and leveraging of resources and expertise)
  - Air agency is responsible for initial notification to EPA (can be delegated to FLM), deciding (with EPA input) whether to submit a demonstration, and submitting the prepared demonstration and/or endorsing the FLM's submission

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Overview of Exceptional Events Rule Revisions Demonstration Development

- Initial event description and flagging associated data submitted to the AQS database
- **Initial notification** by the State to the EPA of a potential exceptional event a required (but waivable) preliminary step before submitting a demonstration
- The State and the appropriate EPA Regional office shall engage in regular communications to identify those data that have been potentially influenced by an exceptional event, to determine whether the identified data may affect a regulatory determination and to discuss whether the State should develop and submit an exceptional events demonstration
- For data that may affect an anticipated regulatory determination or where circumstances otherwise compel the Administrator to prioritize the resulting demonstration, the Administrator shall respond to a State's Initial Notification of Potential Exceptional Event with a due date for demonstration submittal that considers the nature of the event and the anticipated timing of the associated regulatory decision

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Overview of Exceptional Events Rule Revisions Demonstration Submittal

- Established 2015 Ozone NAAQS demonstration submission deadlines:
  - November 29, 2016 (for 2013 - 2015 data)
  - May 31, 2017 (2016 data) for ozone designations promulgated in Oct. 2017 (CAA 2-yr schedule)
  - May 31, 2018 (for 2017 data) only if designations are completed under a 3-year schedule

- Demonstration components
  - Conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from event(s) led to exceedance or violation at affected monitor(s);
  - Sections for each of the 3 technical criteria
    - clear causal relationship supported by comparison to historical concentrations
    - human activity unlikely to recur/natural event
    - not reasonably controllable or preventable
  - Public Input
    - Documentation that (30 day) public comment process was conducted
    - Comments received
    - **Address comments disputing or contradicting factual evidence in demonstration***

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Overview of Exceptional Events Rule Revisions Demonstration Review

- Technical review based on weight of evidence
  - Review applicant responses to comments disputing or contradicting demonstration evidence
  - Possible reviews for timeliness, administrative completeness and technical adequacy.
- Flagging
  - Ensure that the applicable demonstration submittal deadlines are met (if for initial designations)
  - Ensure that the AQS flagged data and request for exclusion in the demonstration agree
  - Where a State demonstrates to the Administrator's satisfaction that such data satisfy the requirements in paragraph (c)(3)(iv)(B) of this section regarding the clear causal relationship criterion and otherwise satisfy the requirements of this section, the Administrator shall agree to exclude all data within the affected calendar day(s). **(PM data only)**
- Request event flagging could trigger mitigation requirements

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Overview of Exceptional Events Rule Revisions Demonstration Review

- General timelines for EPA action and review
  - 60 days - formal response to the Initial Notification
  - 120 days of receipt - initial review of an exceptional events demonstration with regulatory significance
  - 12 months of receipt of a complete demonstration - a decision regarding event concurrence/nonconcurrence
  - 60 days of receipt of a demonstration that the EPA determined during the Initial Notification process to not to have regulatory significance – issue “deferral letter”

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Overview of Exceptional Events Rule Revisions
Mitigation

- Mitigation Plan Requirements
  - Preamble identifies areas with recurring events (generally three events in a 3-year time period, which for final rule purposes was 1/1/13 – 12/31/15)
  - Requires development of mitigation plan (elements specified)
    - Prepared and after notice and opportunity for public comment
    - Submitted for EPA's review and verification of the plan components
    - Administrator shall notify the State upon completion of the review.
  - Identified areas have 2 years from the rule effective date (September 30, 2016 or subsequent notification from the Regional office) to submit a mitigation plan
    - After 2-year period, the EPA will not concur with demonstrations for events that are the focus of the mitigation plan.

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Overview of Exceptional Events Rule Revisions
Mitigation Plan Components

- Required elements
  - Public notification to and education programs
  - Steps to identify, study and implement mitigating measures
  - Measures to abate or minimize contributing controllable sources of identified pollutants.
  - Methods to minimize public exposure to high concentrations of identified pollutants.
  - **Processes to collect and maintain data pertinent to the event**
  - **Mechanisms to consult with other air quality managers** in the affected area regarding the appropriate responses to abate and minimize impacts.
  - **Provisions for periodic review and evaluation of the mitigation plan** and its implementation and effectiveness by the State and all interested stakeholders
- Relationship to other (existing) plans/documents
  - Natural Events Action Plans
  - High Wind Action Plan
  - Smoke Management Program
  - Subpart H Contingency Plan

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Overview of Exceptional Events Rule Revisions
Initial Mitigation Plan and Periodic Reviews

- With the submission of the ***initial*** mitigation plan, State must
  - Document that a draft version of the mitigation plan was available for public comment for a minimum of 30 days
  - Submit the public comments it received along with its mitigation plan to the EPA Regional office
  - In its submission, for each public comment received, explain the changes made to the mitigation plan or explain why the State did not make any changes to the mitigation plan
- The State shall specify in its mitigation plan the periodic review and evaluation process that it intends to follow for reviews following the initial review

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Questions and Comments

AQS Aspects of Exceptional Events Rule

Agenda

- Regulatory Requirements
- Present Air Quality System (AQS) Capabilities
- AQS Changes Required by New Rule
- Other Usability Improvements to Support Rule
- The Path Forward
- Q&A

Regulatory Requirements for AQS (1)

Part 50.14

- Support for initial event definition
- Support for flagging of data associated with causing a violation of a NAAQS
- Support for “concurrence” by the EPA with exclusion of flagged data from Design Values
- For PM: Exclusion of all data for days with concurred flags for specific NAAQS.
- Removal of flagging deadlines

Regulatory Requirements for AQS (2)

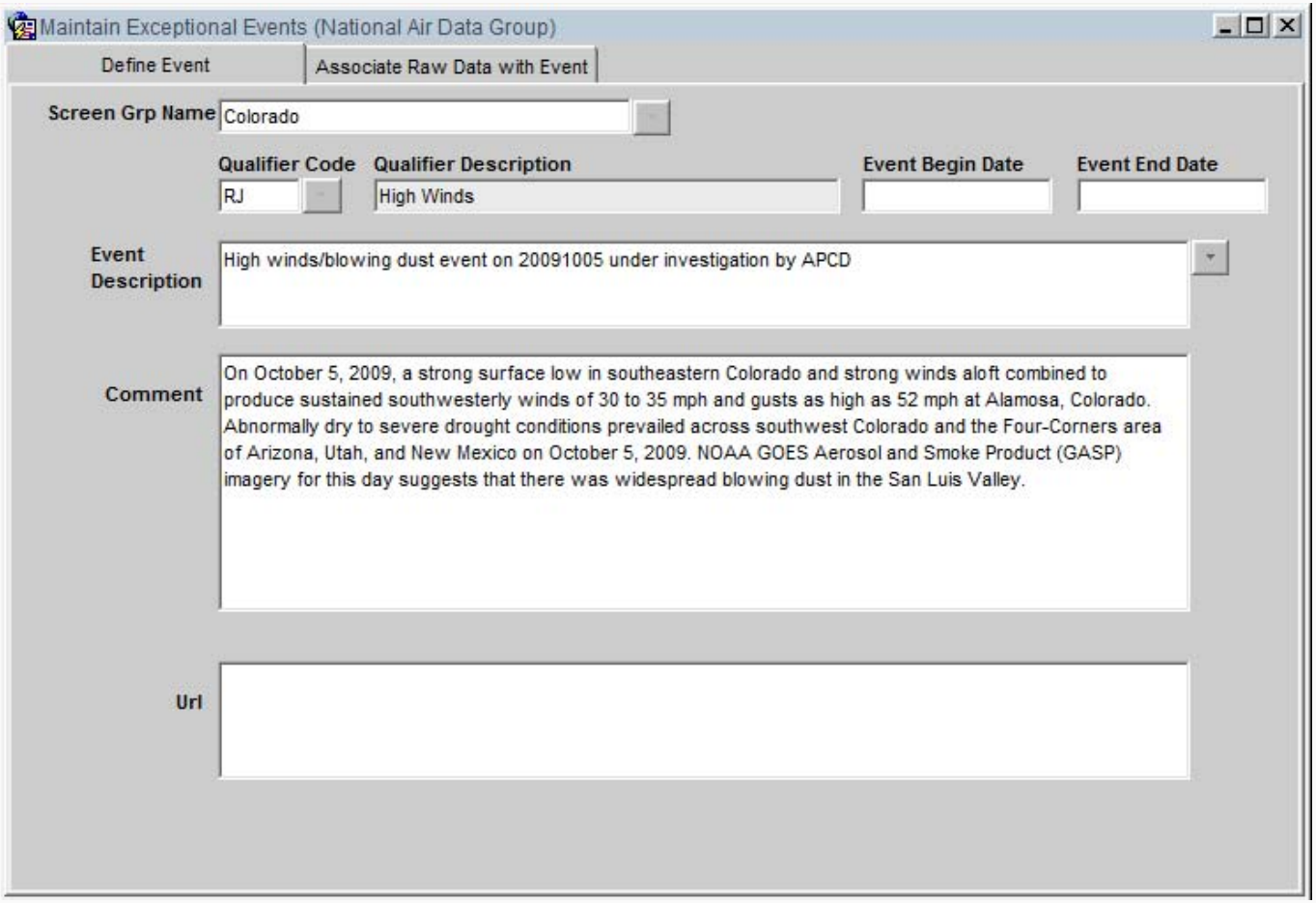
Rule Preamble:

- Support for unique name for event
- Support multiple events for single data point
- Support for additional metadata for event.
- Support for event geographic and temporal scope
- Support or State jurisdictional authority
- Support for association of multiple events with individual sample data measurement (Aggregation 1)
- Support for NAAQS violations caused by multiple events (Aggregation 2)

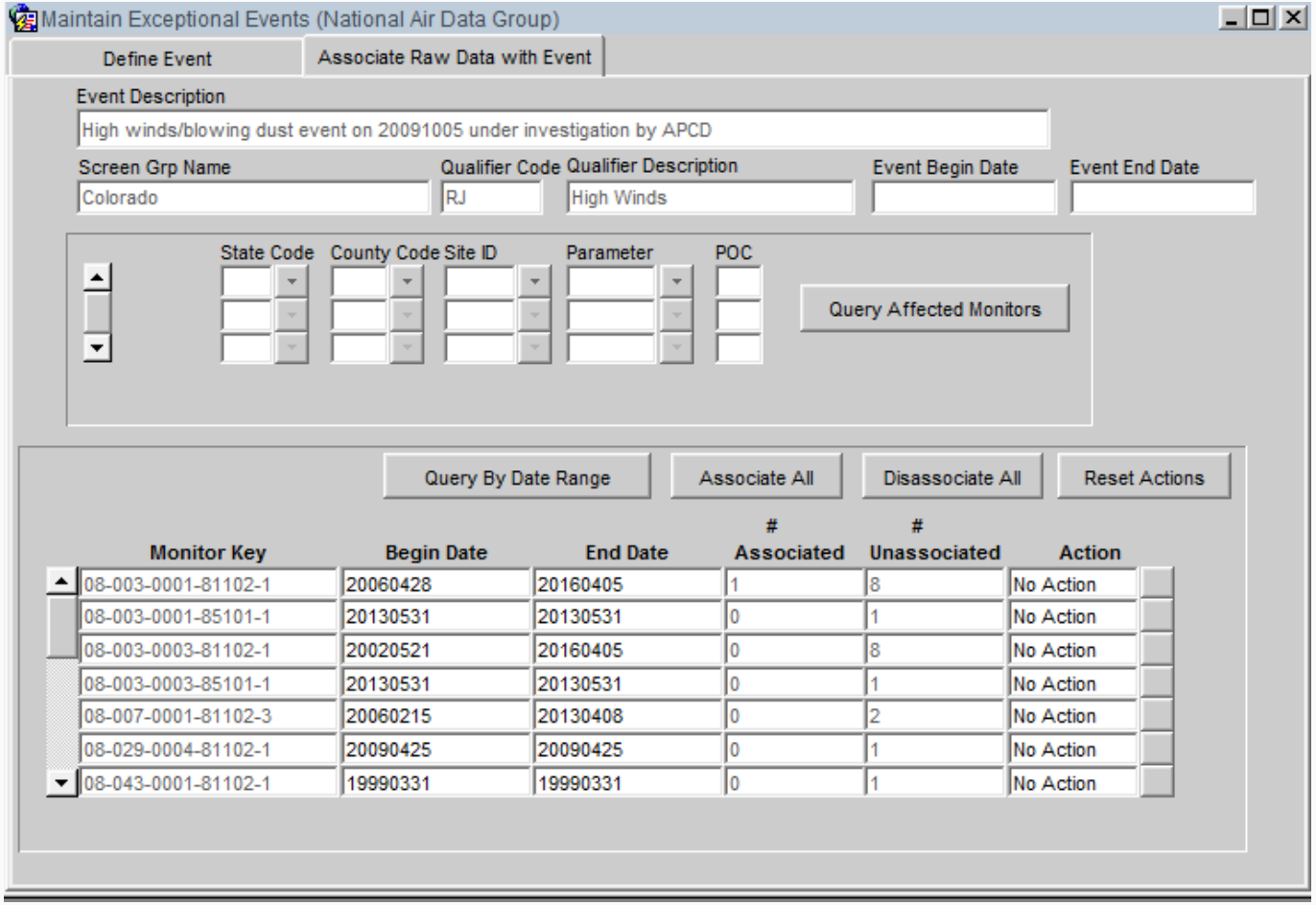
Present AQS Capabilities

- Creating event definitions by Screening Group
- Manual flagging sample measurements
- Associating flagged data with event definitions
- Reports of status of flagged data
- New requirements presently supported
  - Removal of flagging deadlines
  - Aggregation of multiple events per NAAQS Standard (Design Value Period)

Present Maintain Event Form



Present Event Association Form



Present Status Report

United States Environmental Protection Agency
Air Quality System
Raw Data Qualifier Report (v 1.1)

Report Date: May. 13, 2010

Parameter: PM2.5 - Local Conditions (88101)
Standard Units: Micrograms/cubic meter (LC) (105)

Monitor Key / Site Address	Sample Date-Time	Value	Qualifier Code	Qualifier Description	Action Date	NAAQS Standard	Concurrence Ind	Concurrence Date
37-147-0006-88101-1 403 Government Circle	2008-04-06 00:00		AN	Machine Malfunction				
37-147-0006-88101-1 403 Government Circle	2008-04-09 00:00		AN	Machine Malfunction				
37-147-0006-88101-1 403 Government Circle	2008-04-11 00:00	3.5	RC	Chem. Spills & Indust. Accidents		PM25 24-hour 2006 PM25 Annual 2006	Y N	2010-05-12 2010-05-12
	Event:			Test event for R. Coats	2010-05-12	Justification does not meet requirements		
	Comment/URL:			http://www.epa.gov				

Monitor Qualifier Counts: **RC** **Chem. Spills & Indust. Accidents** **Count: 1**
AN **Machine Malfunction** **Count: 2**

AQS Changes – Event Definition

- Event Metadata: Unique name, type (qualifier), description
- Geographic Scope
- Temporal Scope (begin & end dates, required)
- NAAQS Standards (optional at creation)
- Target Date for Demonstration(s)
  - Possibly NAAQS standard specific

AQS Required Changes (2)

- Support for Multiple Events associated with single measurement
- Particulate Matter: Flagging any hour for day will cause entire day to be flagged
- Support for Event Definition use by multiple Agencies (Screening Groups)
- Support for Associating event with affected Sites based on Geographic and Temporal scope
- Interactive (one-step) flagging of sets of data for Site-Parameter and time period

Other Possible Usability Improvements

- Create new “NAAQS Standard” in AQS only when Level or Form changes. (e.g. the 24-hour standard for PM2.5 did not change between the 2006 and 2013 NAAS Revisions)
- Automatic notification (via email) of State air program director and Regional EE contact when event definition associated with monitors in their jurisdiction
- Allow geographic scope of event to be time dependent
- Support for graphical display of concentration time-series for affected Site-Parameter with annotations for NAAQS level and event begin and end dates.
  - Indicate flagged data on time series graph
  - Allow interaction with time series graph to be used for data flagging and/or concurrence
- Allow Event-Affected data to be identified on other AQS outputs

The Path Forward

- The AQS Federal Team proposes creation of a workgroup of Regional and/or SLT stakeholders to help with usability issues. If you are interested in participating, please send and email to coats.robert@epa.gov.
- The AQS team will proceed with required changes that are transparent to users and will work with the workgroup to maximize usability
- Expect to implement most changes by end of Q1, 2017.

Questions?

Roles and Approaches to Managing Prescribed Fire Smoke

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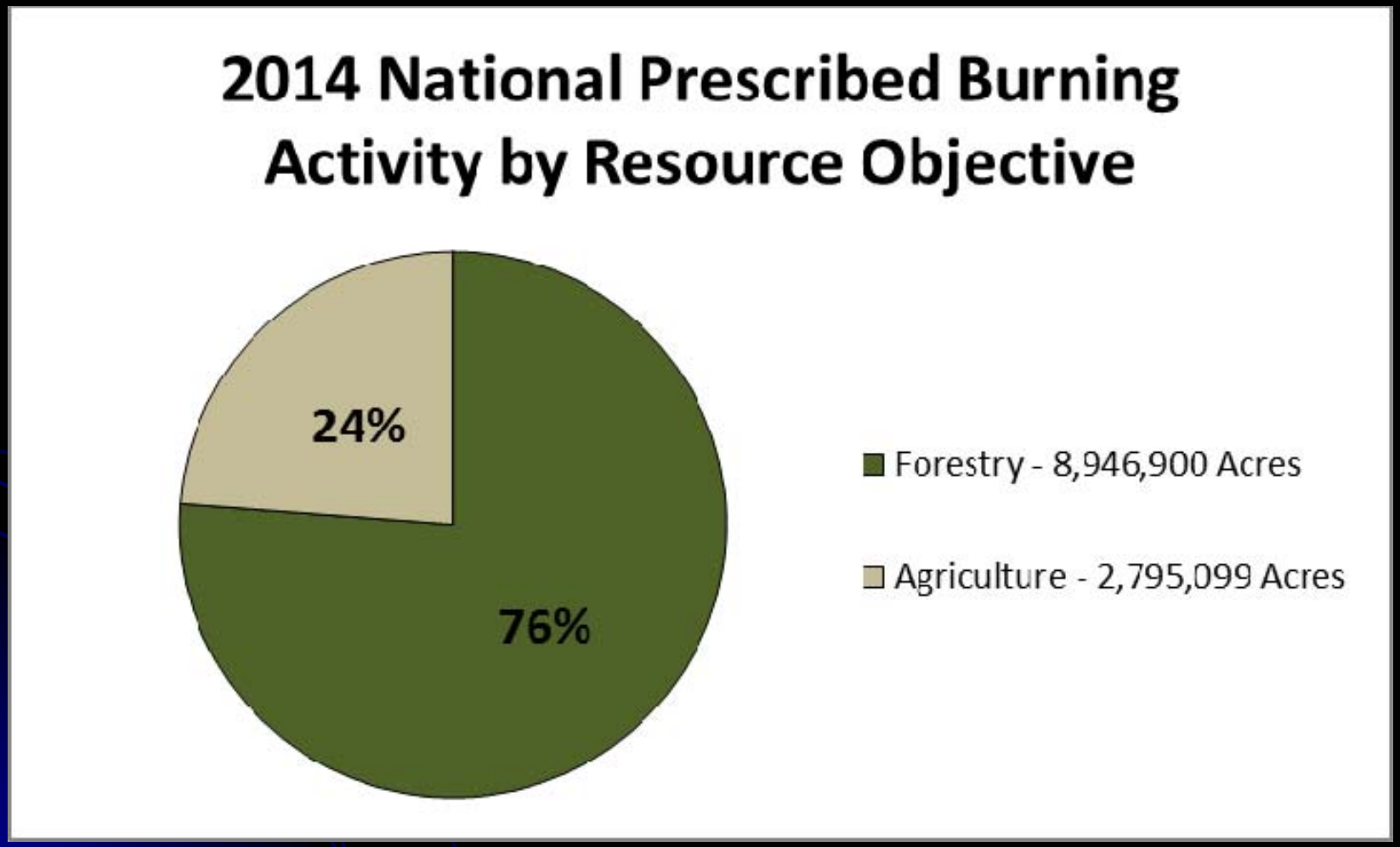
The Context…

- One in three households has someone with respiratory issues: child with asthma, COPD, emphysema, etc. 26 million have asthma in US.
- Conditions: asthma (7.3% prevalence), COPD (6.3% prevalence), chronic rhinitis (20% prevalence), pneumonia, lung cancer & other (CDC).
- Sensitive groups at risk: people with asthma, older adults and those of low income. Science indicates: pregnant women, diabetics.

- Regulatory Drivers for addressing smoke
  - Regional Haze Rule
  - Identified source in nonattainment (historically was not a big cause of exceedances)
  - General Conformity and Exceptional Event Rule
  - PM and Ozone Implementation Rules

- Nuisance…
- And now wildland and agricultural fires contributing to more than 40% of PM2.5 based on the EPA's 2011 National Emission Inventory

2015 National Prescribed Fire Use Survey: Coalition of Prescribed Fire Councils & National Association of State Foresters



Slightly up from 2011 Survey…

Smoke Management Approaches

- Basic Smoke Management Practices
  - The building block of all smoke management effort
  - Applied by individual burners
- Smoke Management Program (SMP)
  - Typically state/tribe-level
  - Recognizes 1998 Interim Policy SMP elements
- Enhanced Smoke Management Program (ESMP) (Regional Haze Rule – Section 309)
  - Recognizes ESMP Development that establishes elements needed when prescribed fire contributes to visibility impairment

Basis Smoke Management Practice	Benefits achieved with the BSMP	When the BSMP is Applied – Before/During/After the Burn
Evaluate Smoke Dispersion Conditions	Minimize smoke impacts	Before, During, After
Monitor Effects on Air Quality	Be aware of where the smoke is going and degree it impacts air quality	Before, During, After
Record-Keeping/Maintain a Burn/Smoke Journal	Retain information about the weather, burn and smoke. If air quality problems occur, documentation helps analyze and address air regulatory issues.	Before, During, After
Communication – Public Notification	Notify neighbors and those potentially impacted by smoke, especially sensitive receptors.	Before, During
Consider Emission Reduction Techniques	Reducing emissions through mechanisms such as reducing fuel loading can reduce downwind impacts.	Before, During, After
Share the Airshed – Coordination of Area Burning	Coordinate multiple burns in the area to manage exposure of the public to smoke.	Before, During, After

[a] The EPA believes that elements of these BSMP could also be practical and beneficial to apply to wildfires for areas likely to experience recurring wildfires.

[b] The listing of BSMP in this table is not intended to be all-inclusive. Not all BSMP are appropriate for all burns. Goals for applicability should retain flexibility to allow for onsite variation and site-specific conditions that can be variable on the day of the burn. Burn managers can consider other appropriate BSMP as they become available due to technological advancement or programmatic refinement.

Smoke Management Program-EER 2016

- Authorization to Burn
  - Process for authorizing prescribed fires on wildland
  - Responsible central authority
- Minimizing Air Pollutant Emissions
  - Encourages consideration of alternative treatments to fire
  - Follow appropriate emission reduction techniques
- Smoke Management Components of Burn Plans
  - If burn plans, should include
    - Actions to minimize fire emissions
    - approaches to evaluate smoke dispersion
    - public notification and exposure reduction procedures
    - air quality monitoring
- Public Education and Awareness
  - Establishes the criteria for issuing health advisories when necessary and procedures for notifying potentially affected populations.

- Surveillance and Enforcement
  - Procedures to ensure compliance with the terms of the SMP.
- Program Evaluation
  - Periodic review of effectiveness
  - Consider the role of prescribed fire in meeting the goals to establish, restore and/or maintain a sustainable and resilient wildland ecosystem and/or to preserve endangered or threatened species.
  - Review air quality impacts, post-burn reports, use of smoke contingency plans
  - Recommendations for future improvements
  - Establish frequency of review
- Certified, Permits (daily or by condition), Voluntary, State Forestry Program, Area Program, Cited in SIP, SIP with federally enforceable provisions (RHR)

Basic Smoke Management Practices

USDA –Natural Resources Conservation Service and Forest Service Tech Note

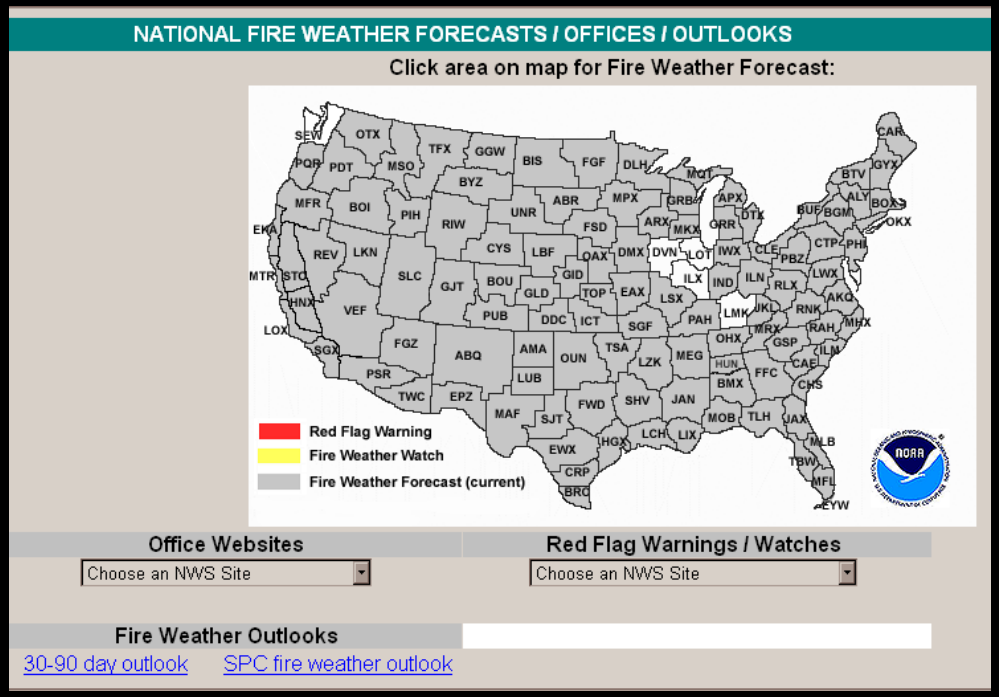
- **<u>Six Basic Smoke Management Practices</u> (BSMPs)**
- **BSMPs have been used in prescribed fire EER documentation successfully**
- **Basic individual burn level of effort managing smoke**
- **Applicable to wildlands & agriculture**

BSMP 1: Evaluate smoke dispersion conditions to minimize smoke impacts

- Before
  - Identify smoke sensitive areas
  - Identify meteorological conditions
- During
  - (critical) Obtain latest meteorological forecast
  - Obtain AQ conditions (AIRNOW) or state/local
  - Verify forecast with observations (RAWS or other)
- After, burn operations
  - Assess smoldering conditions

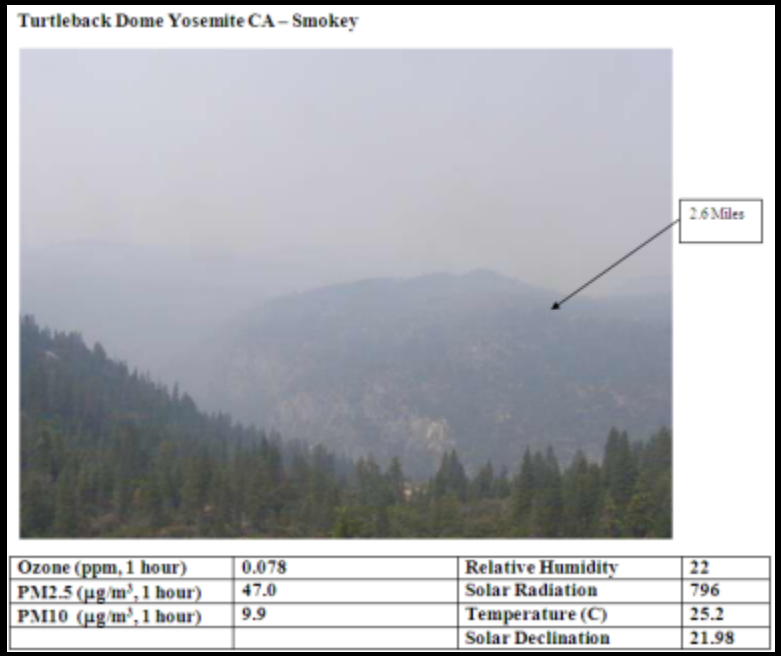
NOAA NWS Fire Weather Forecasts and Observations

- Parameters:
  - Temperature
  - Relative Humidity
  - 20 ft winds
  - Transport winds
  - Smoke Dispersal
  - Mixing Height
  - Haines Index
  - Ventilation
- Text Products
- http://fire.boi.noaa.gov/
- http://www.noaawatch.gov/themes/fire.php
  - Rangeland Fire Danger Forecasts
- Spot weather forecasts and Hysplit run



BSMP 2: Monitor the effects of the fire on air quality

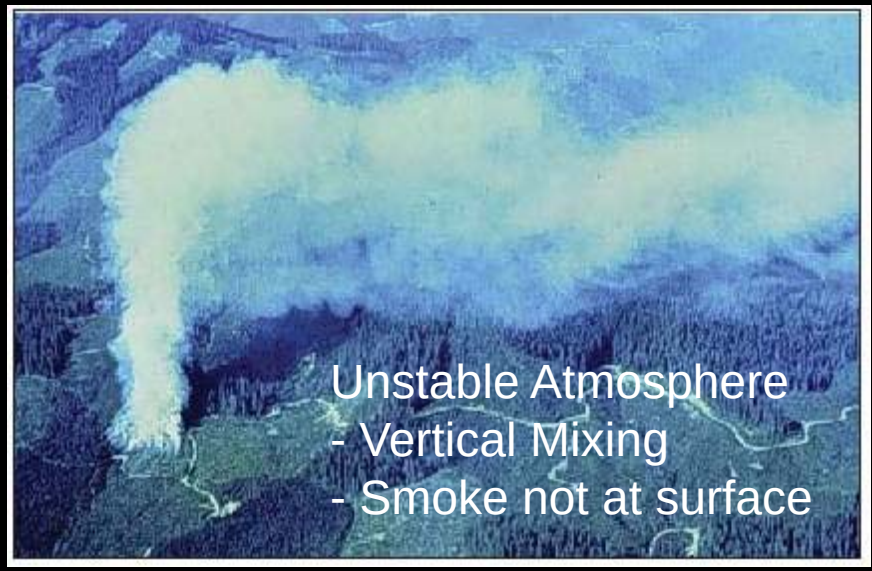
- Assess air quality conditions/forecasts
- Monitoring effects of fire on air quality
  - Where does the smoke go?
  - How high does it go?
  - Does the smoke disperse or is tight and dense?
- Methods
  - Visual monitoring notes/photographs, aircraft observations, satellite imagery,
  - Air quality monitoring data,
- Focus on air quality near sensitive receptors



US Forest Service Smoke Photo Series

Smoke Behavior
Atmospheric Dispersion

- Knowledge of the atmosphere can help with managing smoke
- Fire Weather and Dispersion Modeling can inform no/no-go burn decisions to optimize dispersion



Smoke Behavior
Valley Flows


Photo by Roger Ottmar.

- Smoke caught under a valley inversion

- Smoke can be transported by down-valley winds in the morning

BSMP 3: Record-keeping

- Keep a personal burn/smoke journal.
- What records to keep?
  - Weather (forecasted and observed)
  - BSMPs applied
  - Fire activity (location, area burned, date, ignition time, etc.)
  - Burned acreage (BLACK)
  - Fuel types and consumed
  - Smoke behavior & impacts (if any)
- Assess conditions and burns that meet goals, and provide lessons learned
- Documentation can be key if there is an air quality exceedance and the state seeks to exclude the data. KEEP FOR 5 YEARS!

BSMP 4: Communication – Public Notification

- Notify appropriate authorities (ex. air regulators, public health officials, local fire dept).
- Notify those in the public potentially affected by smoke
- Develop smoke contingency plans (SSA's, roads, etc.)
- If an impact occurs, implement contingency actions to reduce exposure (ex. Communication about impacts & response, mop-up, reducing area burned).

BSMP 5: Consider use of emission reduction techniques (ERTs)

- Ensure objectives are not compromised as ERT's are site specific
- ERTs can include:
  - reducing fuel burned
  - increasing burning efficiency
  - Backing fire….
- Document use of ERT's for NEPA, SMP, SIP or EER use later.

BSMP 6: Share the Airshed – Coordination of Area Burning

- Communication among fire managers burning in the same vicinity on the same day
- Coordinate and plan ignitions so as not to overwhelm the ability of the atmosphere to disperse the smoke
- Current smoke/AQ information
  - AIRNOW (http://www.airnow.gov) or from local/state air quality monitoring networks.
  - NOAA Hazard Mapping System – current satellite fire detections (http://www.osdpd.noaa.gov/ml/land/hms.html)
- Share communications with public

Smoke Management Approaches

- Basic Smoke Management Practices
  - The building block of all smoke management effort
  - Applied by individual burners
- Smoke Management Program (SMP)
  - Typically state/tribe-level
  - Recognizes 1998 Interim Policy SMP elements
- Enhanced Smoke Management Program (ESMP) (Regional Haze Rule – Section 309)
  - Recognizes ESMP Development that establishes elements needed when prescribed fire contributes to visibility impairment

Enhanced Smoke Management Program

- Regional Haze Rule – Section 309
- Limited Use
- Added annual emission goal through use of emission reduction techniques (PM2.5)
- Importance of tracking emissions, ERTs and regional coordination

Federal Land Manager Policies (USFS, BLM, NPS, FWS, BIA) and Roles

- NWCG Interagency Prescribed Fire Planning and Implementation Procedures Guide
  - Expectations for prescribed burning, planning for smoke, implementation and response when unplanned smoke impacts occur (AAR)
- Training Requirements - Prescribed Fire Boss
  - RX-410 Smoke Management Techniques
  - Regionally taught classes (some state forestry)
- NWCG Prescribed Fire Smoke Management Guide out in early 2017 (see poster at ISS2)

Federal Land Manager Policies (USFS, BLM, NPS, FWS, BIA) and Roles

- Forest Service - FSM 5140 Policy on Rx Fire
  - Use of BSMP required
    - explicit tracking will need to be added
  - NOV or exceedance reporting and AAR requirements

Wildland Fire – Federal Land Manager Roles

- EER Wildland Fire = Two types of fire, Wildfire and Prescribed Fire
  - Characterizing the source and smoke movement
    - Envisioned as a collaborative process
    - Process is being developed internally (FS) to support these needs
- Daily Perimeter Growth (Blackened acres best)
- Fuel Type(s)
- Fuel Loadings (for the various fuels consumed in the daily growth including smolder)
- Fuel Consumption by fuel type by day
- Indication of daily burn intensity which may help quantify plume height
- Smoke transport, impact and concentration information
  - WF = Air Resource Advisor Reports, support documentation and data
    - See wildlandfiresmoke.net
    - BlueSky runs @ 12, 4 and special 1 km runs are archived
  - Rx = Tracking of Basic Smoke Management Practices
- Other sources of data or observations to support source quantification (webcams, lookout tower info., vertical distribution and movement

Data Acquisition

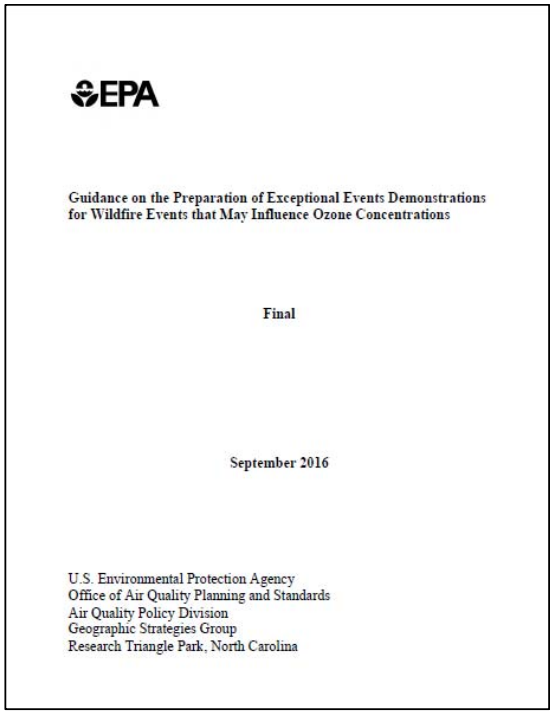
- Best data is at the local level for most elements
  - They have access to wildfire records and daily information
  - They have all the information regarding the prescribed fire
  - Initial request soon after the event is best practice
- Agency Administrator where the fire occurred (Ranger District, National Forest)
- Fuels Specialist or Fire Management Officer at the administrative unit
- There are remote sources for some of the data but validation at the local level should be the norm
  - Remote sources have variable quality
- Rx Fire - Land Management Plan citations for role of fire for the area where the fire occurred

EXCEPTIONAL EVENTS UPDATES
Case Study: Wildfire Ozone

Michael Flagg
Air Quality Analysis Office, Region 9 – U.S. EPA
Exceptional Events Workshop
November 2016

Overview

- Initial Notification Process
- Components of a Wildfire Ozone Demonstration
  - Conceptual Model
  - Clear Causal Relationship
- Examples of Evidence and Analysis
  - Tier I
  - Tier II
  - Tier III


EPA

Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations

Final

September 2016

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Policy Division
Geographic Strategies Group
Research Triangle Park, North Carolina

For illustration and discussion purposes only

Initial Notification: Washoe County, Nevada

Communication tool used to assess regulatory significance and critical path analysis

- Applicable NAAQS
- Affected Regulatory Decision
- Area Name/Designation Status
- Design Value Period
- Event Narrative
- Event Specific Concentrations
- Design Value Calculations

For illustration and discussion purposes only

Initial Notification: Washoe County, Nevada

Initial Notification of Potential Exceptional Event Information Summary

Submitting Agency: Washoe County Health District, Air Quality Management Division
Agency Contact: Daniel Inouye, Branch Chief
Date Submitted: June 3, 2016
Applicable NAAQS: 2006 24-Hour $PM_{2.5}$ and 2015 8-Hour Ozone
Affected Regulatory Decision[1]: Attainment of the 2015 8-Hour Ozone NAAQS
Area Name/Designation Status: Washoe County Attainment Area
Design Value Period: 2013-2015

Narrative: On August 18, 2015 smoke from numerous wildfires in the Northwest portion of California impacted the Reno/Sparks area. The smoke impacts contributed to several exceedances of the National Ambient Air Quality Standards (NAAQS) for Particulate Matter less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$) and Ozone (O_3) at several sites in the Washoe County Health District, Air Quality Management Division's (AQMD) monitoring network. The AQMD requests that the Regional Administrator for Region IX of the U.S. Environmental Protection Agency (EPA) accepts this Initial Notification so an Exceptional Events Demonstration document can be prepared to petition for the exclusion of the air quality monitoring data effected from these fires from the normal planning and regulatory requirements under the Clean Air Act (CAA) in accordance with the Exceptional Events Rule (EER).

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Initial Notification: Washoe County, Nevada

Table A (1):
Information specific to each flagged site day that may be submitted to EPA in support of the affected regulatory decision listed above.

Date(s) of Event	NAAQS Standard	Type of Event (high wind, volcano, wildfires/prescribed burns, other)	AQS Flag	Site AQS ID	POC	Site Name	Monitor Concentration
08/21/2015	$PM_{2.5}$	Northwest Wildfires	RT	32-031-0016 32-031-1005	3 1	Reno3 Sparks	38.8 $\mu g/m^3$ 39.2 $\mu g/m^3$

*Data was flagged in AQS on 04/14/2016 and 05/03/2016 as Wildfire Event from 08/18/2015 (00:00) to 08/21/2015 (23:59)

Table A (2):
Information specific to each flagged site day that may be submitted to EPA in support of the affected regulatory decision listed above.

Date(s) of Event	NAAQS Standard	Type of Event (high wind, volcano, wildfires/prescribed burns, other[2])	AQS Flag	Site AQS ID	POC	Site Name	Monitor Concentration
08/18/2015	Ozone	Northwest Wildfires	RT	32-031-0016	1	Reno3	0.075 ppm
				32-031-1005	1	Sparks	0.070 ppm
				32-031-0025	1	Toll	0.068 ppm
				32-031-0020	1	South Reno	0.073 ppm
				32-031-2009	1	Lemmon Valley	0.069 ppm
				32-031-2002	1	Incline	0.063 ppm
08/19/2015	Ozone	Northwest Wildfires	RT	32-031-0016	1	Reno3	0.073 ppm
				32-031-1005	1	Sparks	0.071 ppm
				32-031-0025	1	Toll	0.069 ppm
				32-031-0020	1	South Reno	0.071 ppm
				32-031-2009	1	Lemmon Valley	0.067 ppm
				32-031-2002	1	Incline	0.061 ppm
08/20/2015	Ozone	Northwest Wildfires	RT	32-031-0016	1	Reno3	0.070 ppm
				32-031-1005	1	Sparks	0.069 ppm
				32-031-0025	1	Toll	0.070 ppm
				32-031-0020	1	South Reno	0.070 ppm
				32-031-2009	1	Lemmon Valley	0.068 ppm
				32-031-2002	1	Incline	0.061 ppm
08/21/2015	Ozone	Northwest Wildfires	RT	32-031-0016	1	Reno3	0.073 ppm
				32-031-1005	1	Sparks	0.072 ppm
				32-031-0025	1	Toll	0.073 ppm
				32-031-0020	1	South Reno	0.072 ppm
				32-031-2009	1	Lemmon Valley	0.067 ppm
				32-031-2002	1	Incline	0.064 ppm

For illustration and discussion purposes only

Initial Notification: Washoe County, Nevada

Table C (1):
Summary of Maximum Design Value (DV) Site Information for **24-Hour $PM_{2.5}$** (Effect of EPA Concurrence on Maximum Design Value Site Determination)

Maximum DV site (AQS ID) **without EPA concurrence** on any of the events listed in Table A (1) above	Design Value 32	Design Value Site Sparks (32-031-1005)	Comment
Maximum DV site (AQS ID) **with EPA concurrence** on all events listed in Table A (1) above	Design Value 32	Design Value Site Sparks (32-031-1005)	Comment

Table C (2):
Summary of Maximum Design Value (DV) Site Information for **8-Hour Ozone** (Effect of EPA Concurrence on Maximum Design Value Site Determination)

Maximum DV site (AQS ID) **without EPA concurrence** on any of the events listed in Table A (2) above	Design Value 71	Design Value Site Reno3 (32-031-0016)	Comment
Maximum DV site (AQS ID) **with EPA concurrence** on all events listed in Table A (2) above	Design Value 70	Design Value Site Reno3 (32-031-0016)	Comment

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Conceptual Model

- Description of the geographic area
- Typical non-event O_3 formation and meteorology
  - Average O_3 daily profiles
  - Seasonal variation
- Summary of fires
  - Description of the 2015 wildfire season
  - Locations of specific fires
  - Fire maps
- Event specific O_3 concentrations

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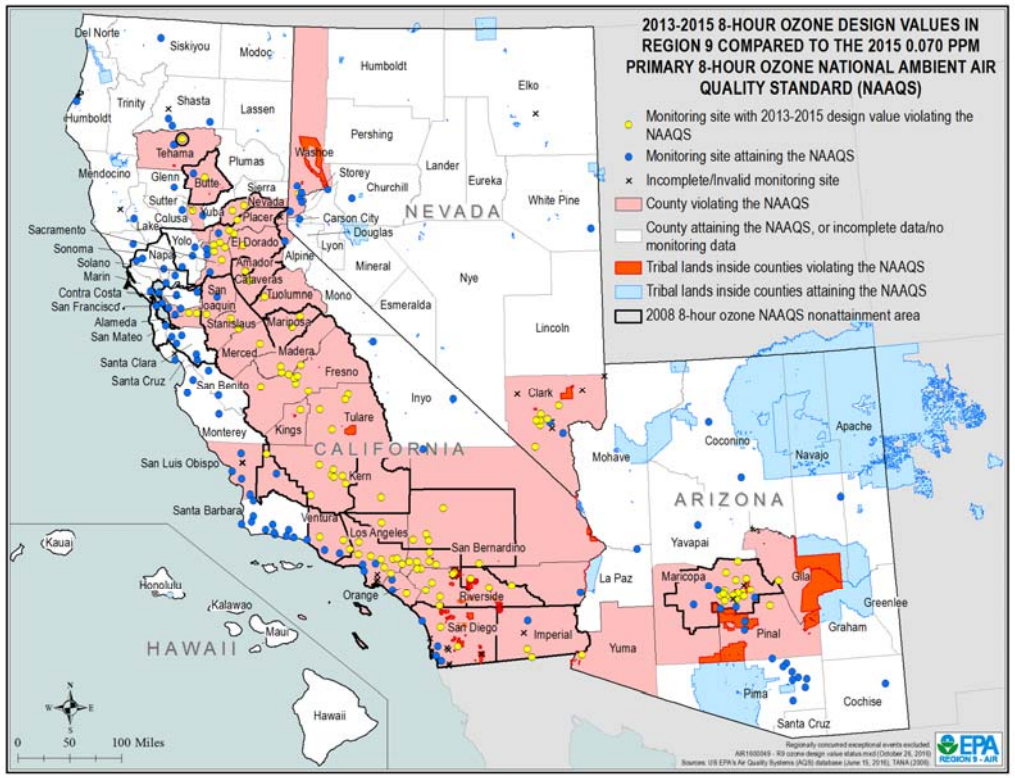
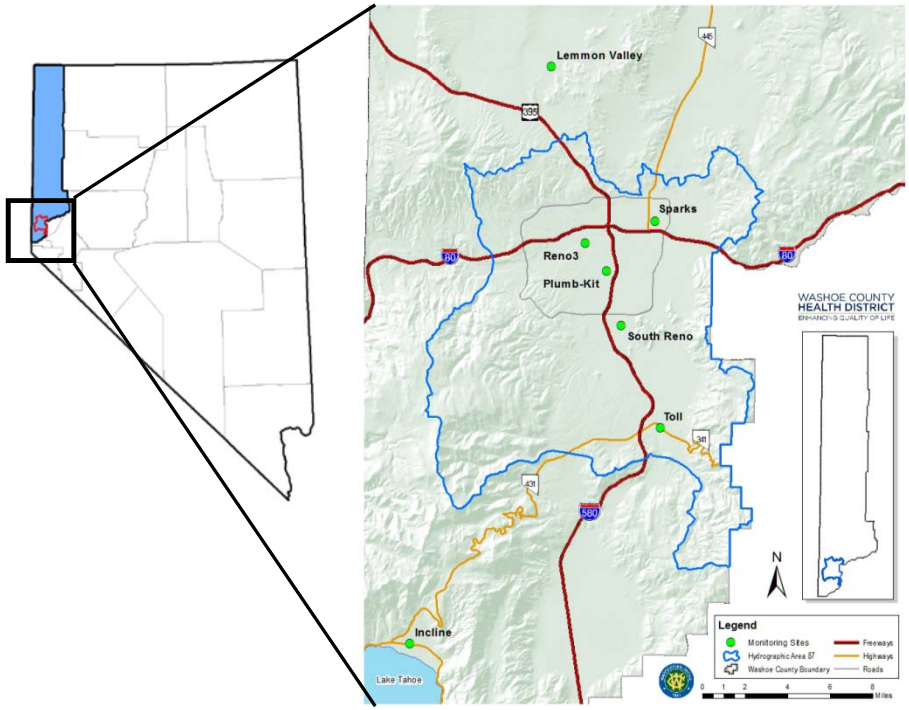
Conceptual Model





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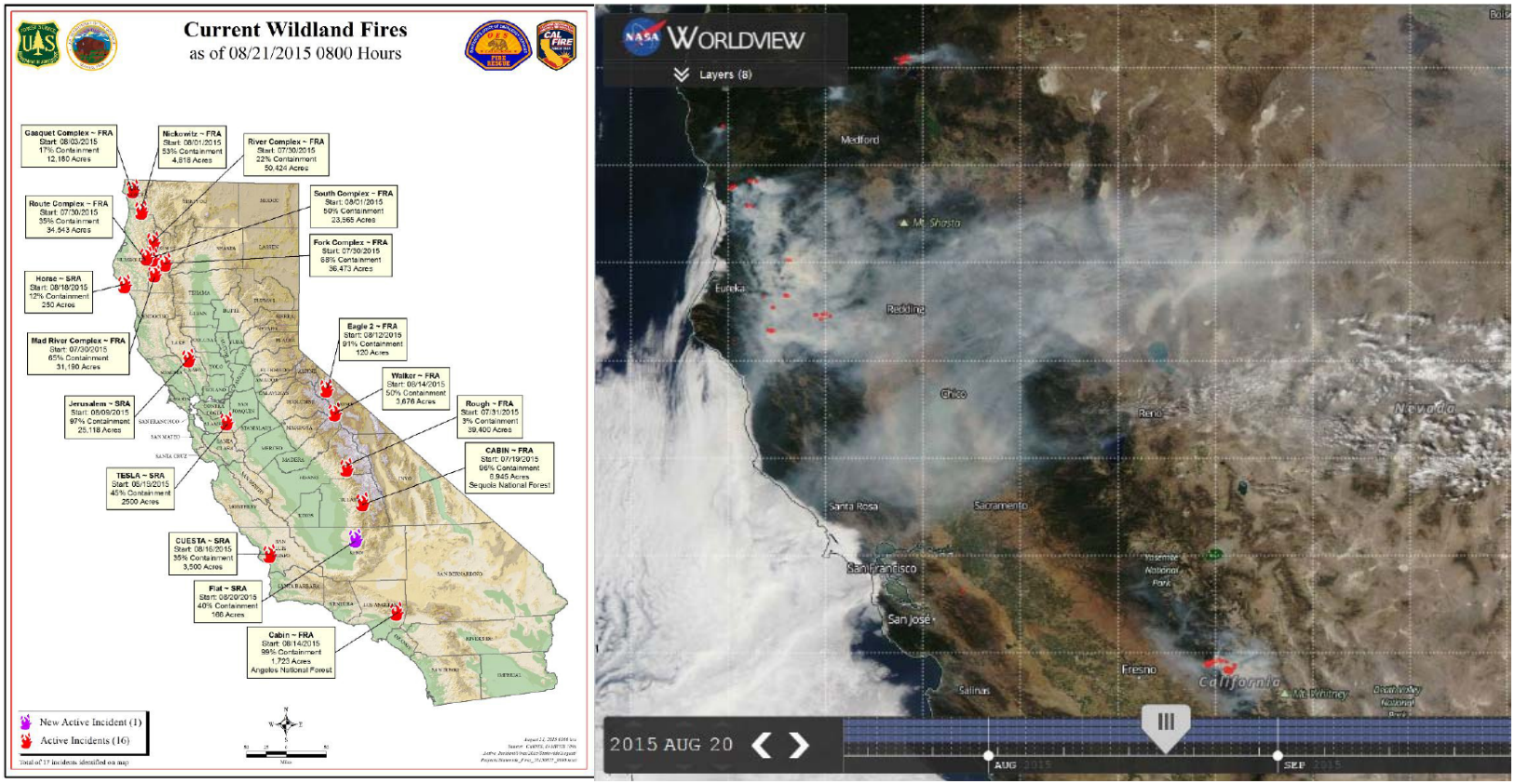
Conceptual Model



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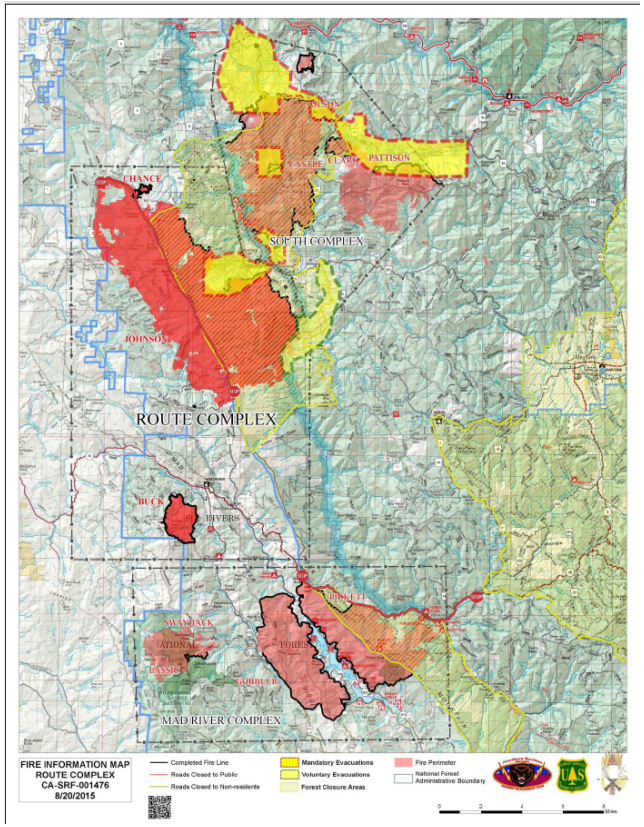
Conceptual Model



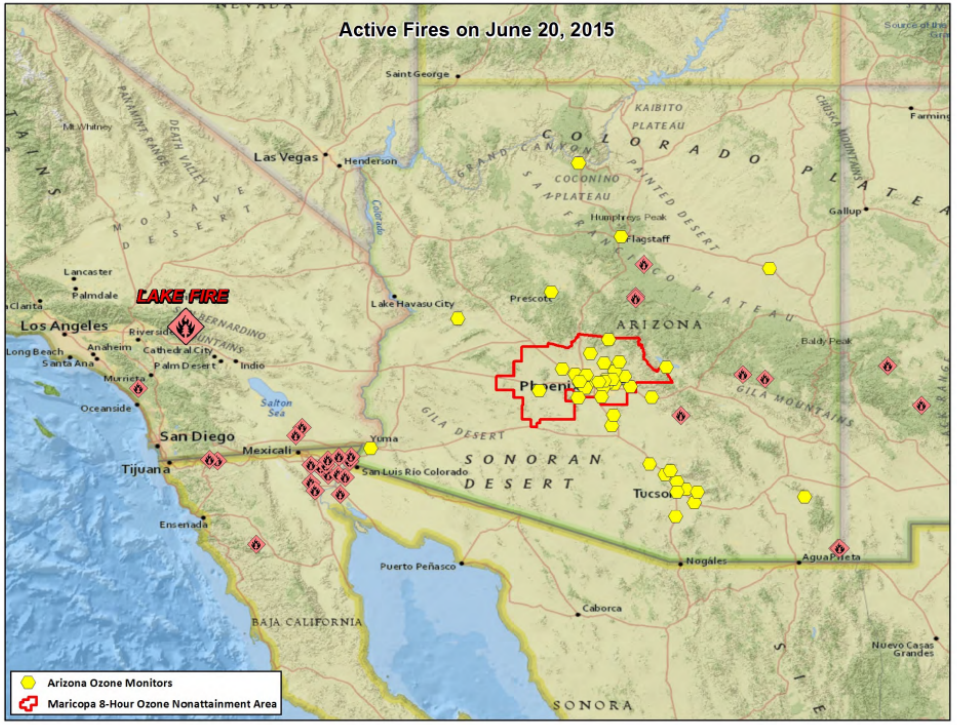


Figure 2-7. Active wildfires on June 20, 2015 in Arizona, southeastern California and northern Mexico.

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Tier I

Wildfire events that clearly influence O_3 exceedances or violations in areas that typically experiences lower O_3 concentrations. This tier is associated with an O_3 concentration that is clearly higher than non-event related concentrations, or occur outside of the area's normal O_3 season.

Key Factor

Seasonality or distinctive level of the monitored O_3 exceedance

- *Outside normal O_3 season*
- *5-10 ppb higher than non-event related concentrations*

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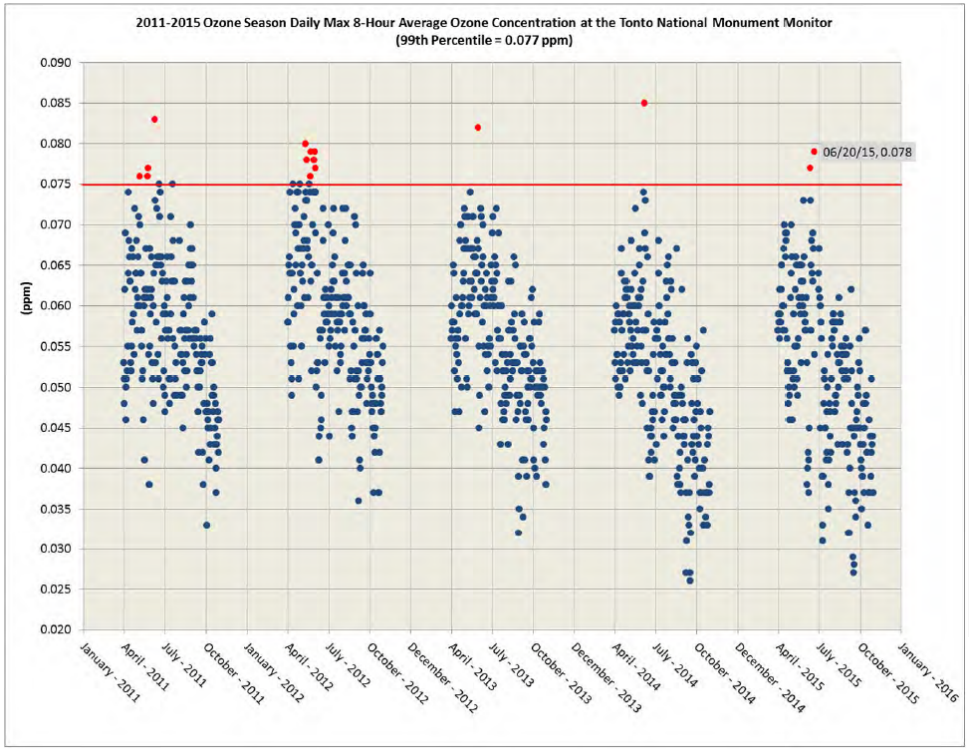
Tier I



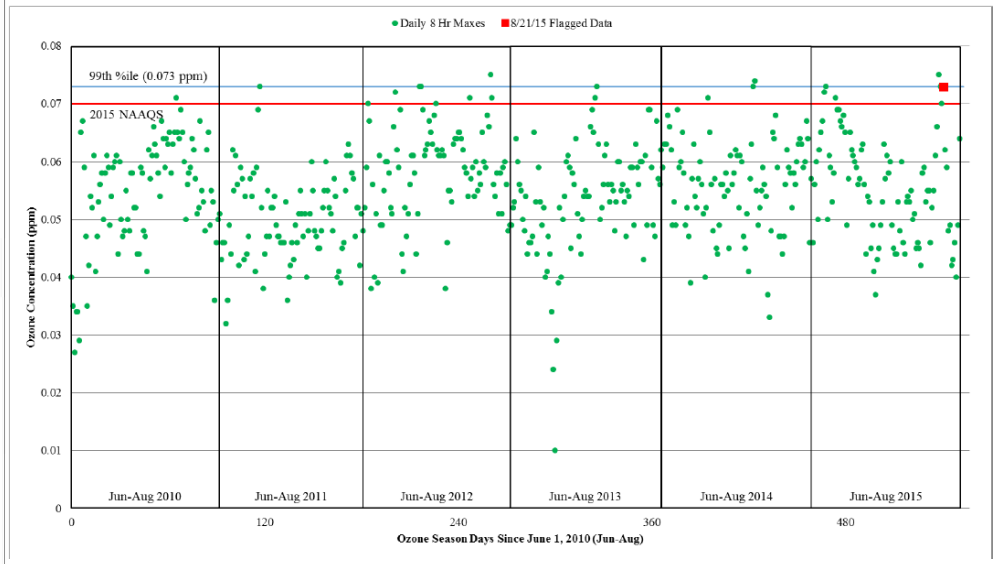


Figure 3-6. Plot of 5-year ozone season daily maximum 8-hour average concentrations at the Tonto National Monument monitor.

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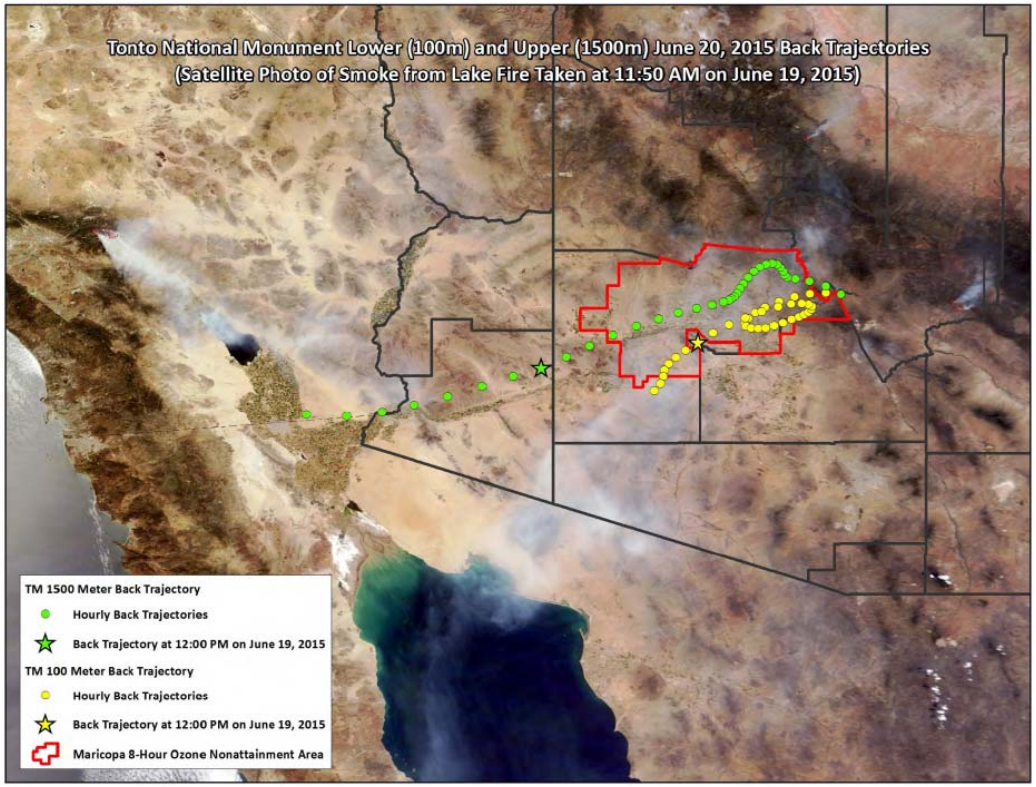
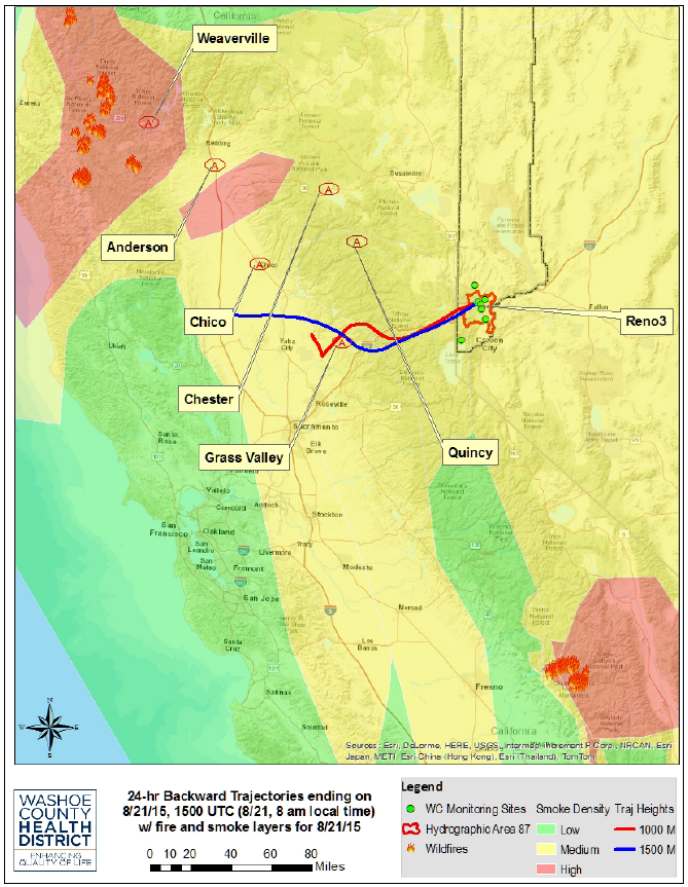
Clear Causal Relationship: Tier I

(1) Trajectory Analysis (2) Satellite Imagery





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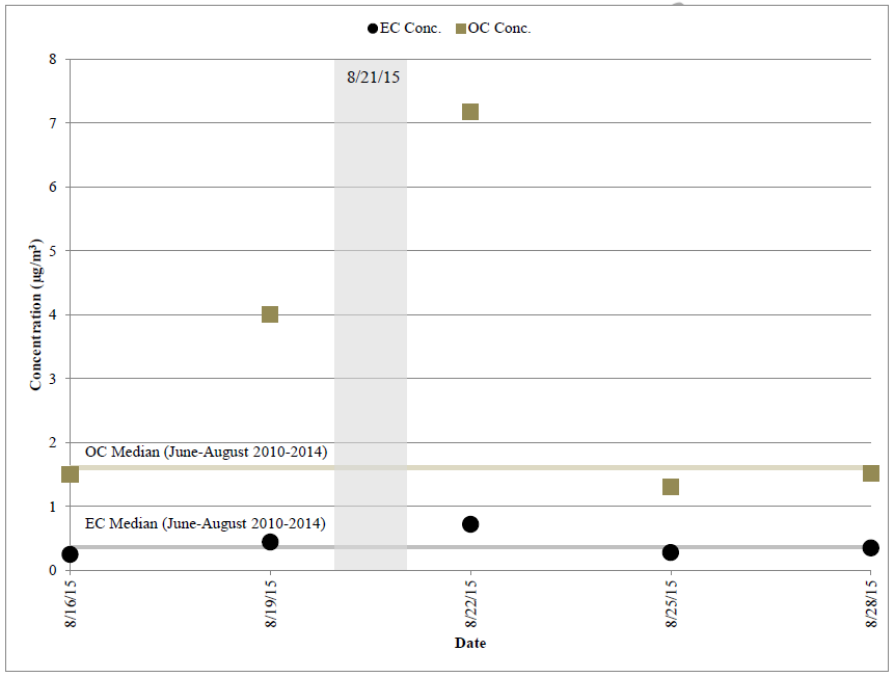
Clear Causal Relationship: Tier I

(3) Evidence of the Plume Impacting the Ground

Figure 3.14: Elemental & Organic Carbon Concentrations during the 2015 Wildfires



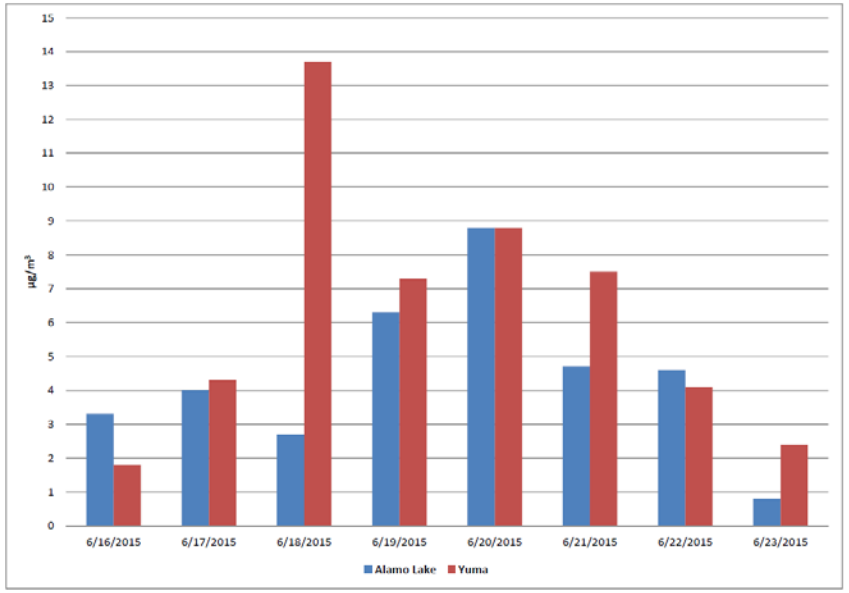


Figure 3-31. 24-Hour $PM_{2.5}$ concentrations at Alamo Lake and Yuma during June 16-23, 2015.

For illustration and discussion purposes only

Tier II

Wildfire events that do not meet the criteria of Tier I

Key Factor #1

Fire emissions and distance of fire(s) to affected monitoring site location

- *Q/D >= 100 tons/km*

Key Factor #2

Comparison of the event-related O_3 concentration with non-event high O_3 concentrations

- *99^{th} or higher percentile of 5-year distribution*
- *One of the four highest values within 1 year*

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Tier II

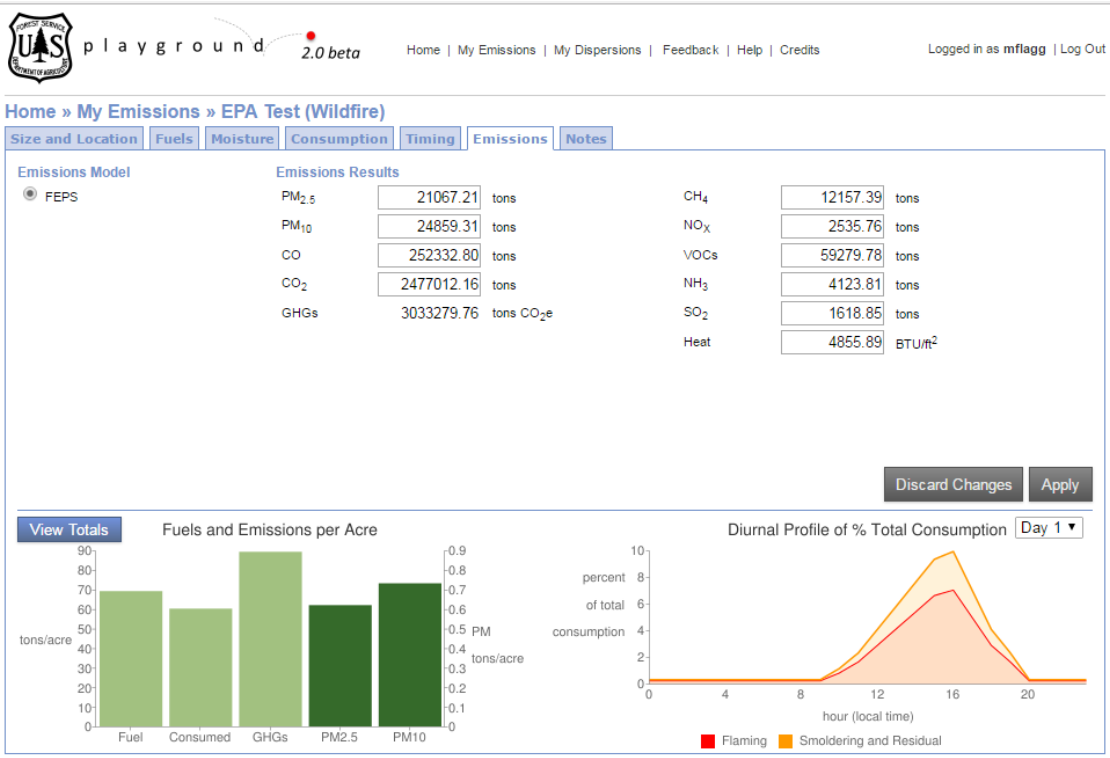

Table 3.1: Q/D Calculations for Seven Northwest Wildfires on August 20, 2015

Fire Name	Lat/Long	Distance (km)	Acres	Emissions (tons)	Q/D (tpd/km)
Fork Complex	40.45/-123.128	187	1,120		
Mad River Complex	40.34/-123.383	197	3,622		
South Complex	40.62/-123.448	207	290		
Route Complex	40.64/-123.586	215	1,391		
River Complex	40.91/-123.437	214	2,622		
Gasquet Complex	41.85/-123.969	271	3,563		
Nickowitz	41.47/-123.75	246	904		
Totals			13,512	24,566	86

Table 3.2: Q/D Calculations for Seven Northwest Wildfires on August 21, 2015

Fire Name	Start Lat/Long	Distance (km)	Acres	Emissions (tons)	Q/D (tpd/km)
Fork Complex	40.45/-123.128	187	188		
Mad River Complex	40.34/-123.383	197	1,106		
South Complex	40.62/-123.448	207	758		
Route Complex	40.64/-123.586	215	193		
River Complex	40.91/-123.437	214	2,325		
Gasquet Complex	41.85/-123.969	271	1,357		
Nickowitz	41.47/-123.75	246	152		
Totals			6,079	11,053	39

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Tier II

Figure 3.1: Reno3 8-Hour Daily Ozone Season Maximums June-August, 2010-2015

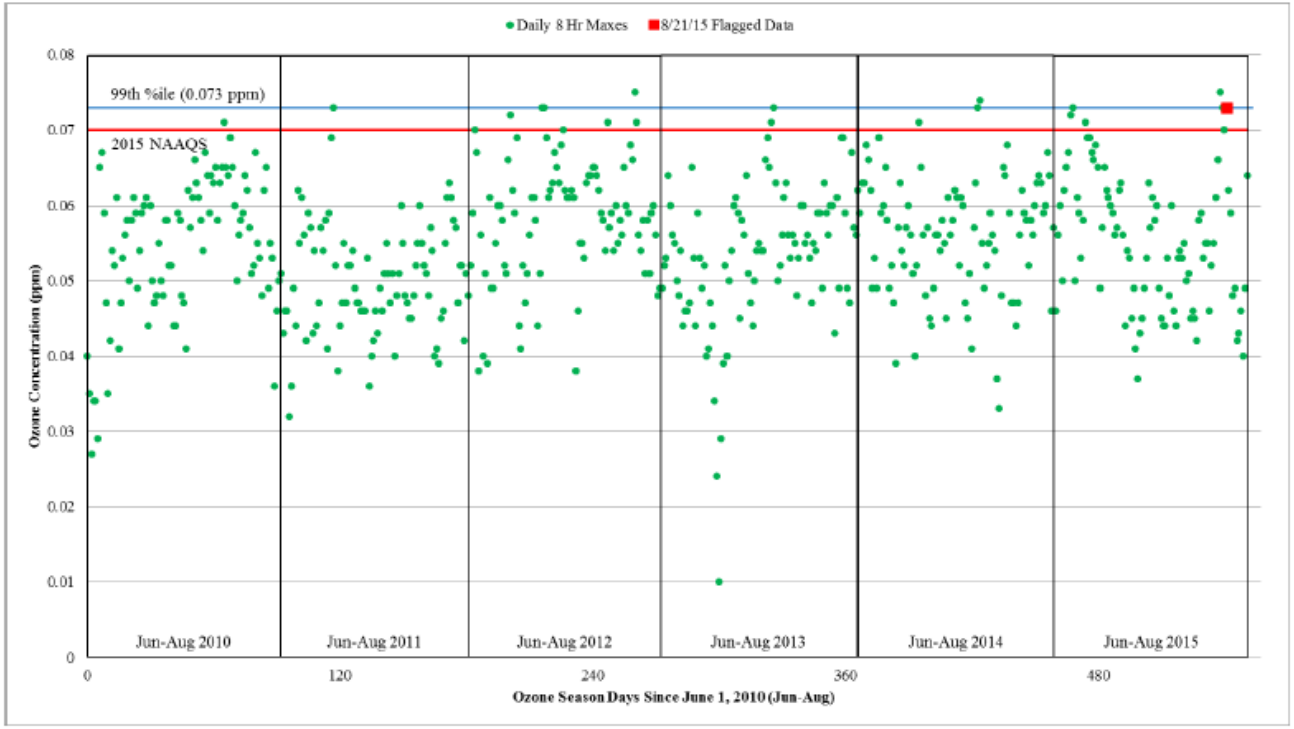

Table 1.3: Historic 8-hour Ozone Concentrations at Reno3

Percentile	Concentration (ppm)
100	0.075
99	0.073
95	0.068
50	0.055

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Clear Causal Relationship: Tier II

(1) Tier I Analysis

(2) Addition evidence that the emissions from the wildfire affected the monitored O_3 concentration

a) Evidence of changes in spatial/temporal patterns of O_3 and/or NOx

b) Photographic evidence of ground-level smoke at the monitor

c) Concentrations of supporting ground level measurements

- CO
- PM (mass or speciation)
- VOCs
- Pollutant Ratios

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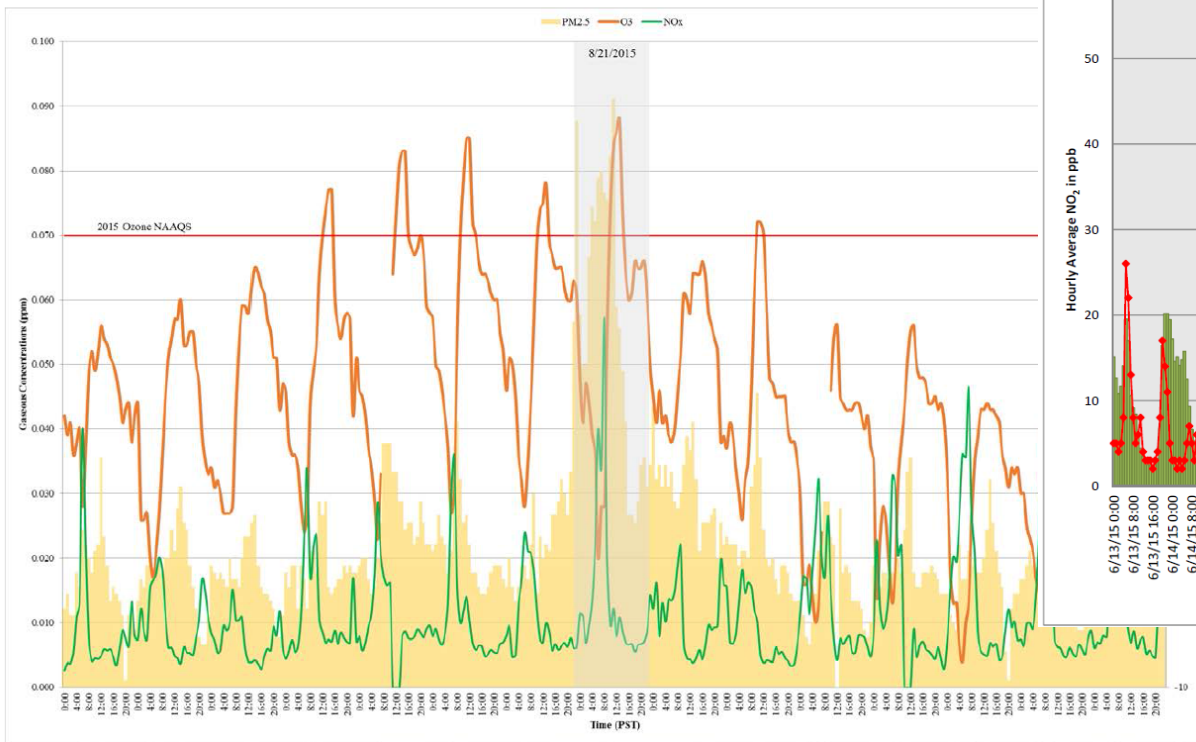
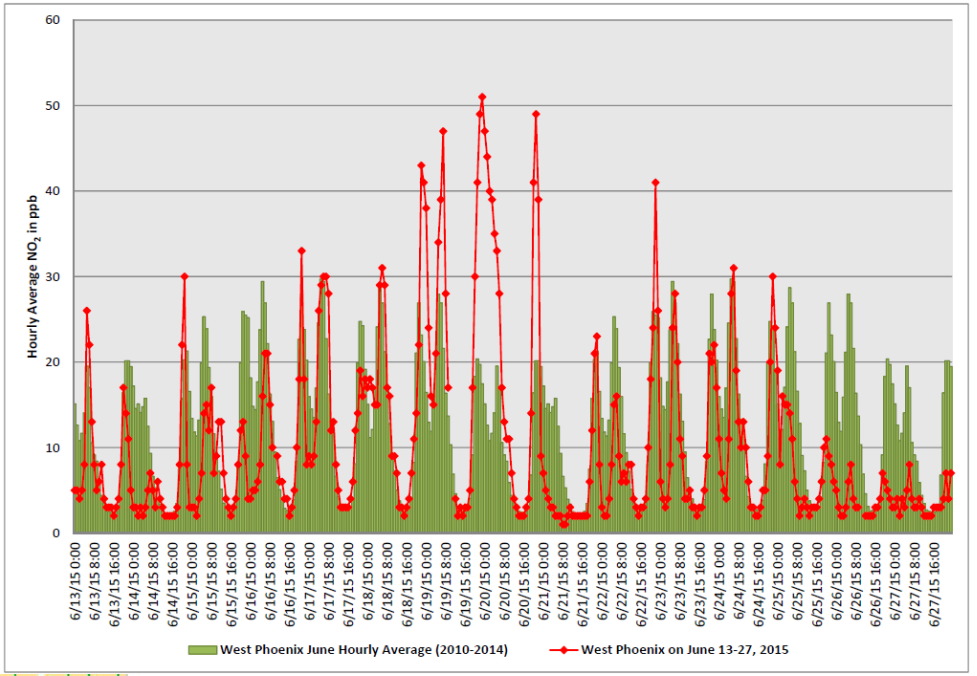
Clear Causal Relationship: Tier II, (2)(a),(2)(c)

Figure 2.7: Reno3 Ozone, NOx, and $PM_{2.5}$ Hourly Concentrations for August 14-28, 2015





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Clear Causal Relationship: Tier II, (2)(a)

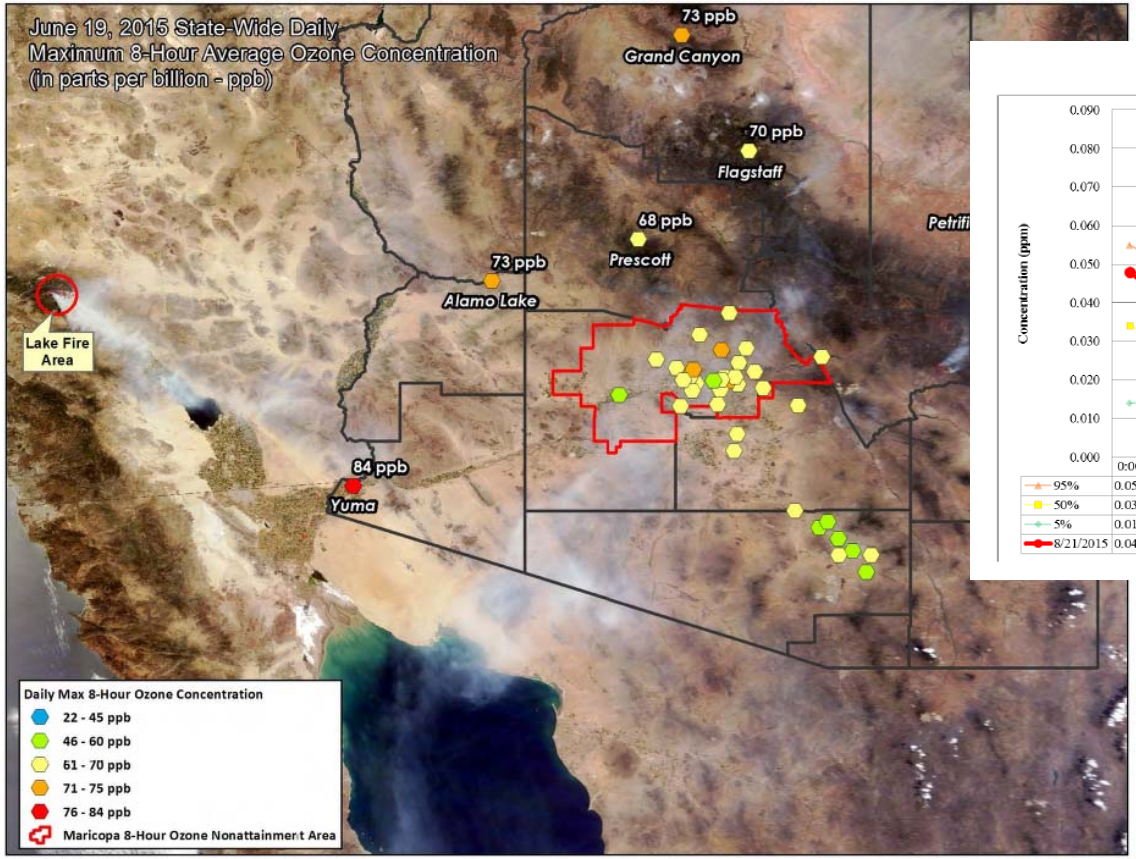
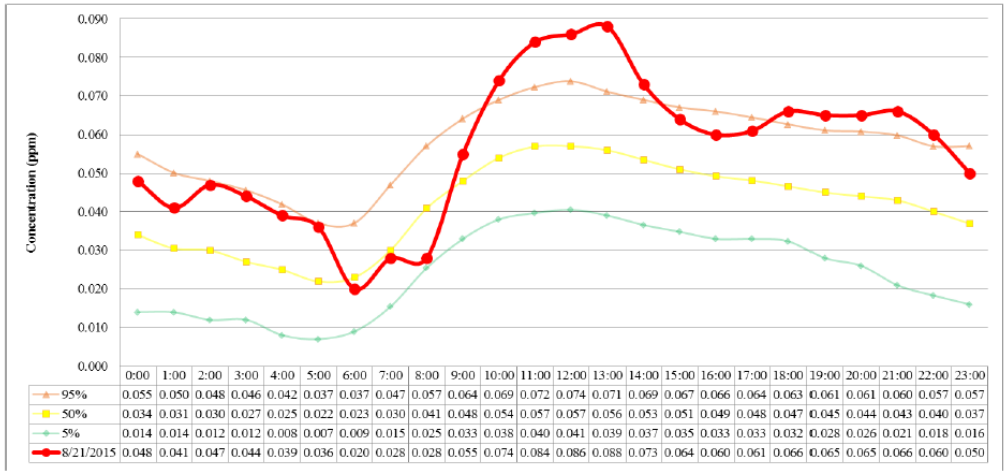


Figure 3.3: Percentiles for Hourly Seasonal Ozone for 2010-2014 with August 21, 2015



	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
95%	0.055	0.050	0.048	0.046	0.042	0.037	0.037	0.047	0.057	0.064	0.069	0.072	0.074	0.071	0.069	0.067	0.066	0.064	0.063	0.061	0.061	0.060	0.057	0.057
50%	0.034	0.031	0.030	0.027	0.025	0.022	0.023	0.030	0.041	0.048	0.054	0.057	0.057	0.056	0.053	0.051	0.049	0.048	0.047	0.045	0.044	0.043	0.040	0.037
5%	0.014	0.014	0.012	0.012	0.008	0.007	0.009	0.015	0.025	0.033	0.038	0.040	0.041	0.039	0.037	0.035	0.033	0.033	0.032	0.028	0.026	0.021	0.018	0.016
8/21/2015	0.048	0.041	0.047	0.044	0.039	0.036	0.020	0.028	0.028	0.055	0.074	0.084	0.086	0.088	0.073	0.064	0.060	0.061	0.066	0.065	0.065	0.066	0.060	0.050

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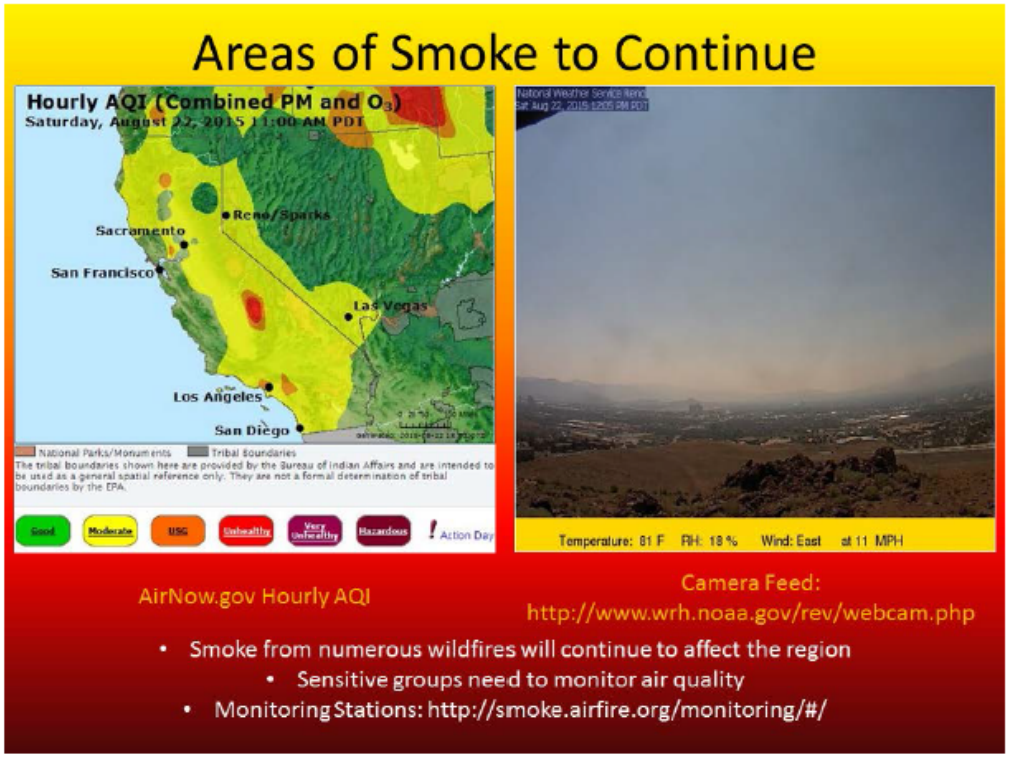
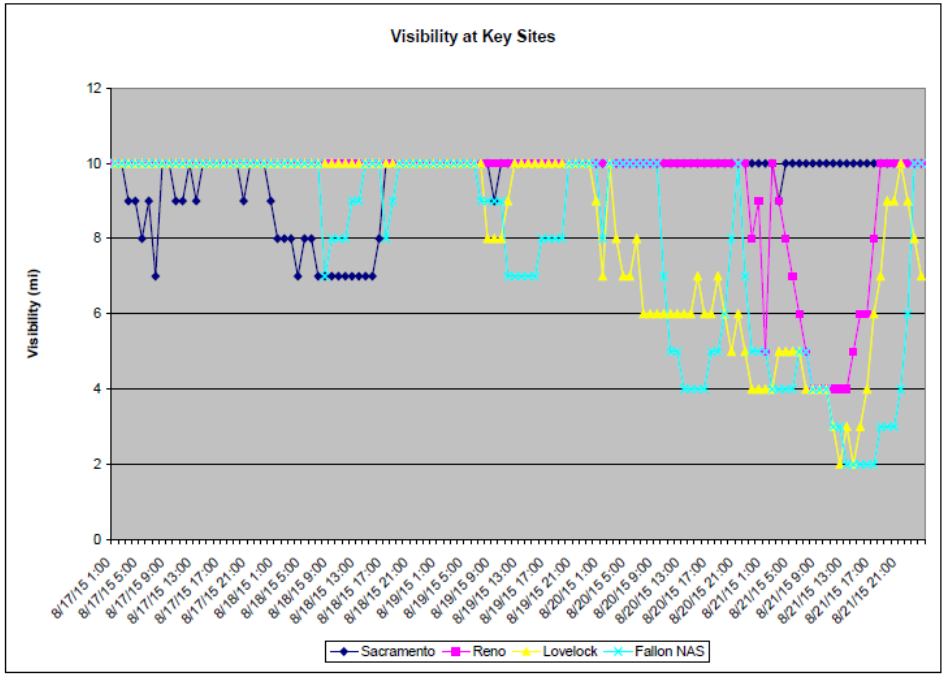
Clear Causal Relationship: Tier II, (2)(b)

Figure 2.18: National Weather Service Weather Story from August 22, 2015





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Tier III

Wildfire events that do not meet the criteria of Tier II

(1) Tier I Analysis
(2) Tier II Analysis
(3) Additional Analysis to Support the Clear Causal Relationship
   a) Comparison of O_3 concentrations on Meteorologically Similar Days (Matching Day Analysis)
   b) Statistical Regression Modeling
   c) Photochemical Modeling

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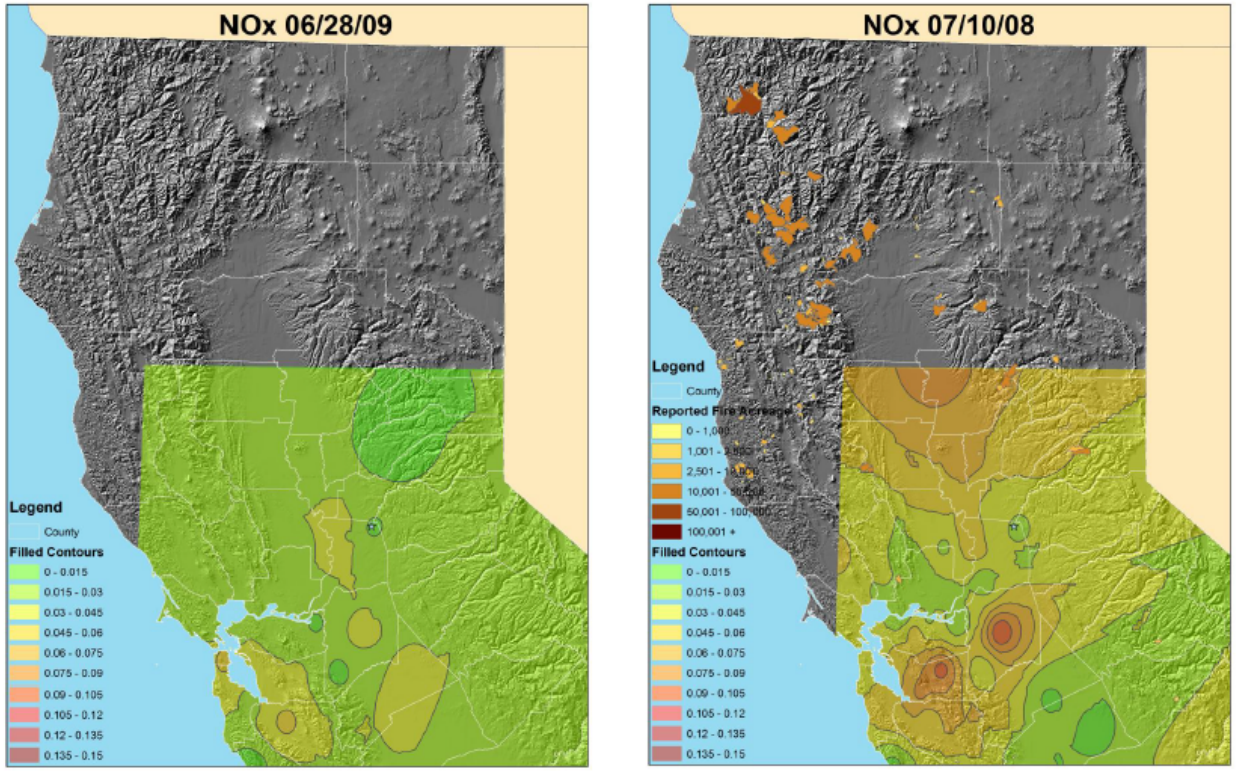
Clear Causal Relationship: Tier III

Maximum 1-hour Surface NO_x Concentrations on Surrogate and Fire Days



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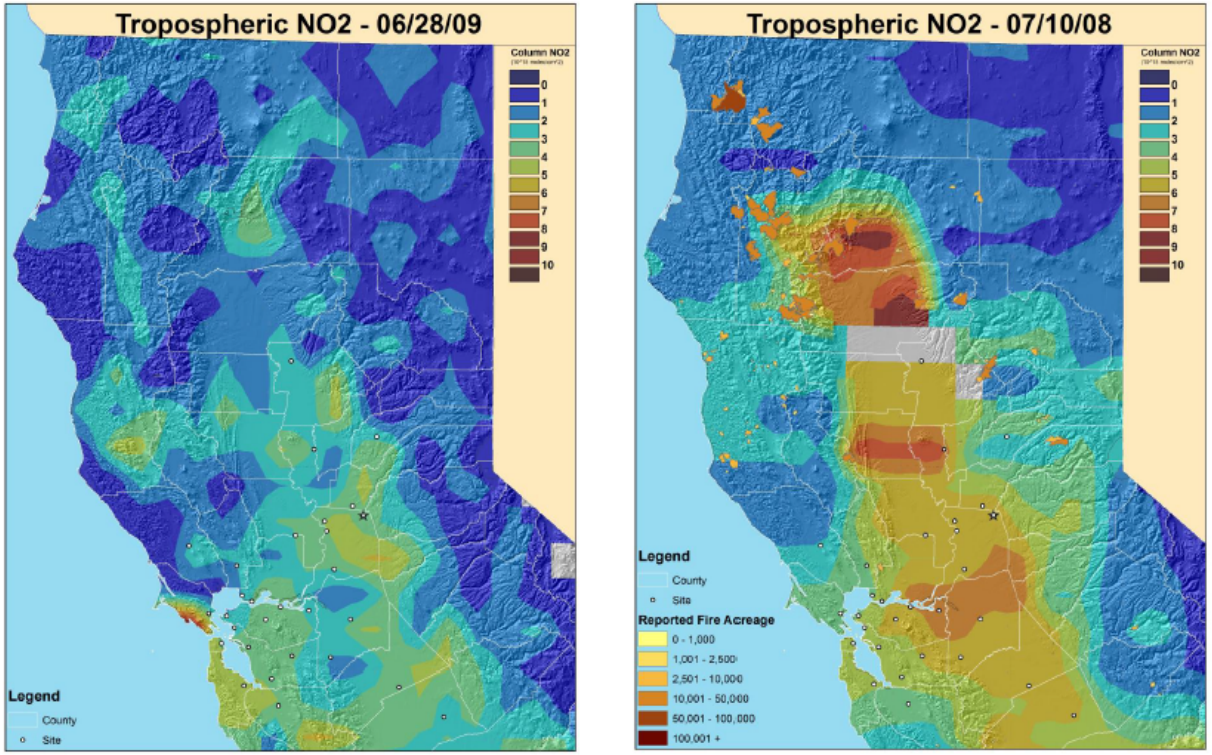
Clear Causal Relationship: Tier III

Tropospheric NO_2 Concentrations on Surrogate and Fire Days



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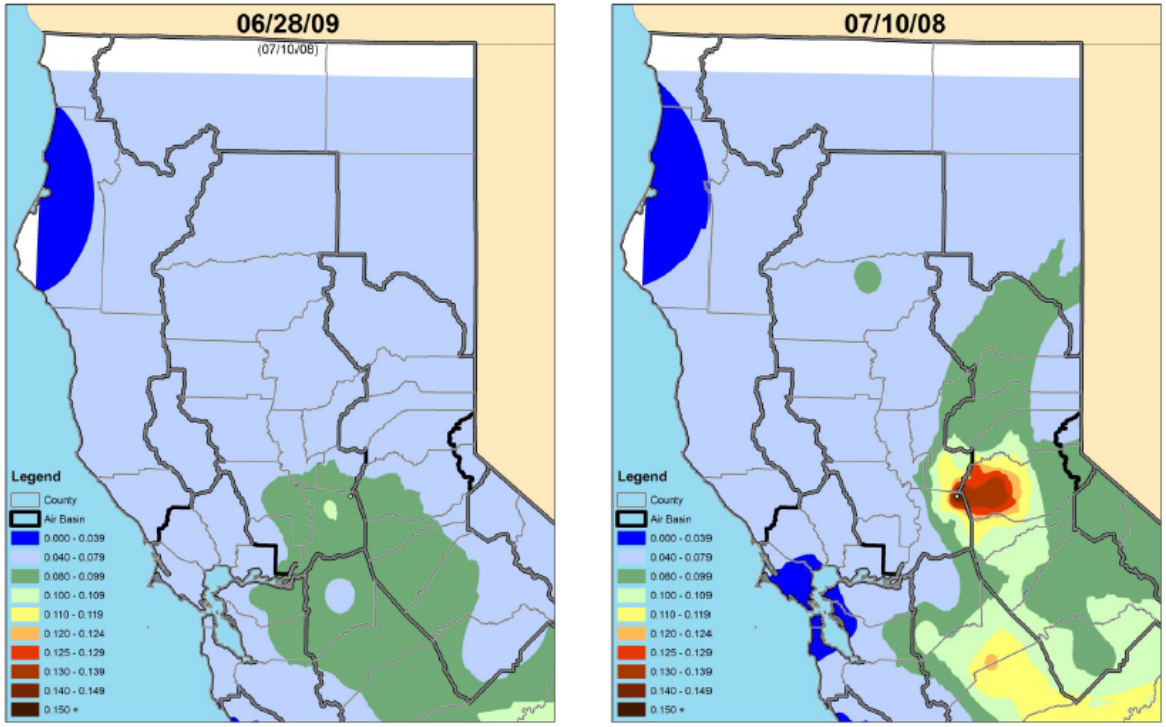
Clear Causal Relationship: Tier III

Maximum 1-hour Ozone Concentrations on Surrogate and Fire Days



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Questions and Comments

Stratospheric Ozone Intrusion Exceptional Events

Uinta Basin, June 8-9, 2015 Case Study

Richard Payton, EPA Region 8

Exceptional Events Implementation Workshops

November 2016

Outline

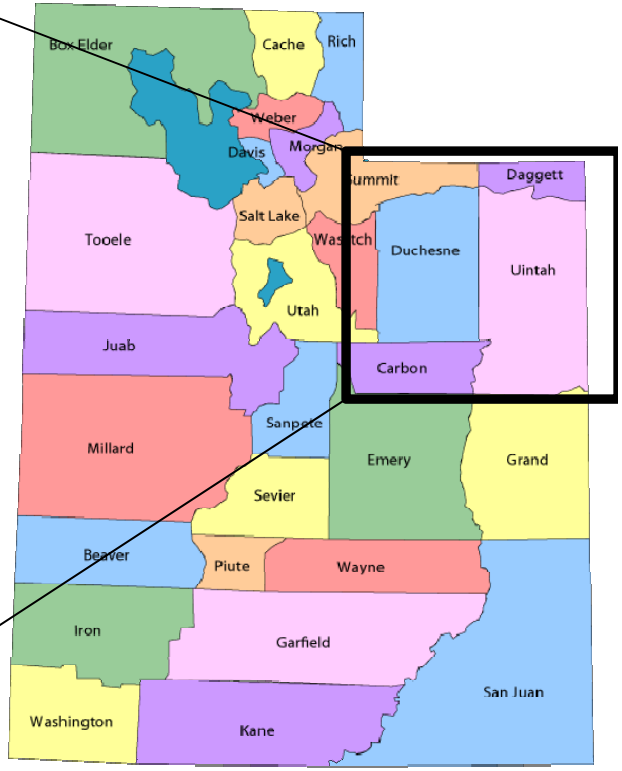
- Background
  - EE Rule and Tribal Monitoring
  - Stratospheric Ozone Intrusions
- Demonstration Elements
  - Conceptual Model
  - Event Occurred and Affected Air Quality
  - Clear Causal Relationship Between the Event and Exceedance(s)
  - Historical Data Comparison
  - Not Reasonably Controllable or Preventable
  - Natural Event
- Concluding Remarks & Discussion

Exceptional Events Rule and Tribes

- Clean Air Act required the EPA to promulgate rules to allow "the Governor of a State" to petition the Administrator to exclude air quality monitoring data
- 40 CFR 50.14(a)(1)(ii) provides that "A State, federal land manager or other federal agency" may request the Administrator to exclude data
- 2016 EE Rule Preamble, 81 FR 68224 explicitly continues the applicability of the exceptional event rule to tribal agencies operating ambient air monitors that produce regulatory data
  - Footnote 3 clarifies that "air agencies" includes state, local and tribal agencies
  - 2007 and 2016 rules extend support by the EPA to those tribal monitoring agencies requesting assistance in applying the rule

June 8 & 9, 2015 Stratospheric Ozone Event

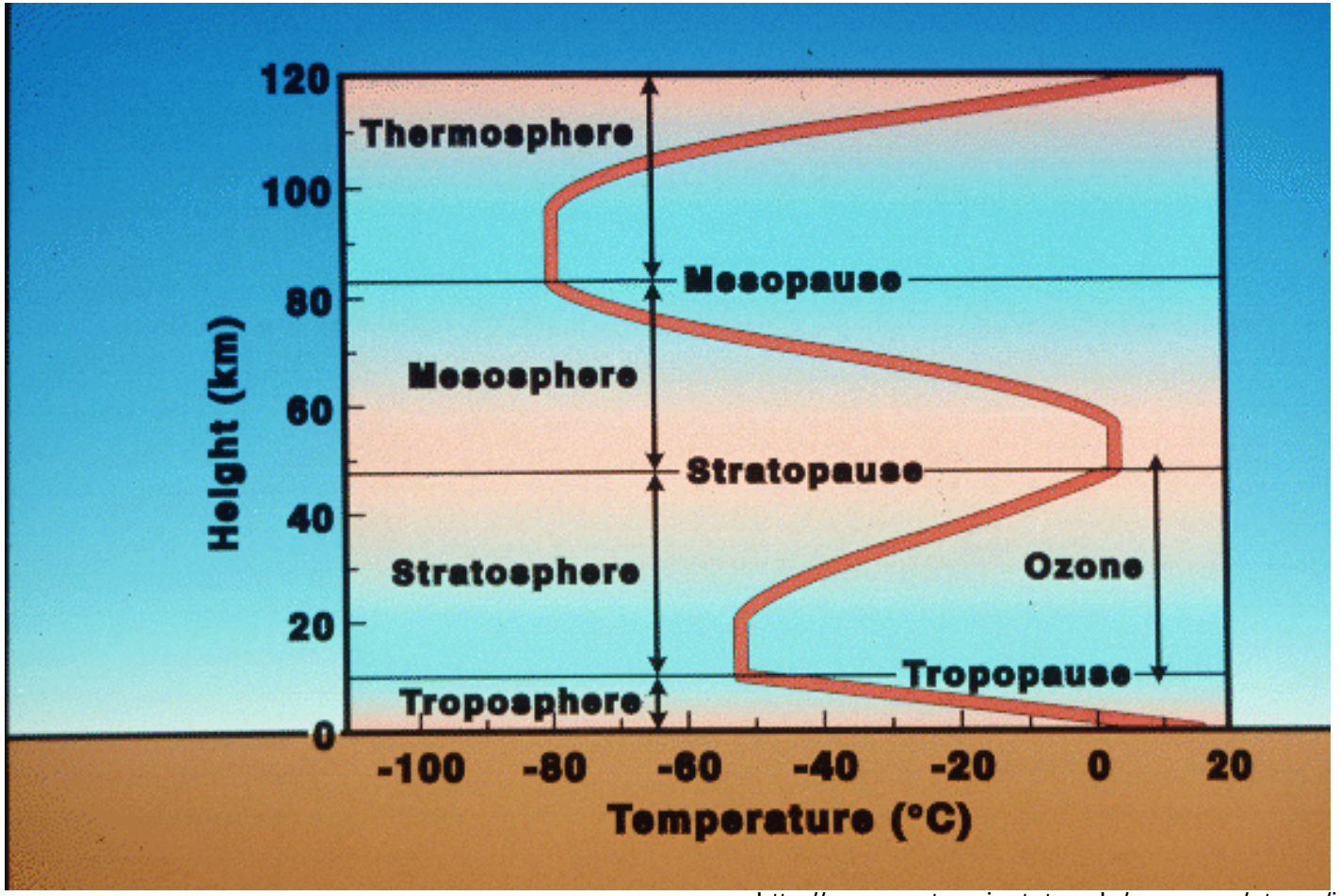
- The Ute Indian Tribe of the Uinta and Ouray Reservation operates 4 ozone monitors in the Uinta Basin Unclassifiable Area in eastern Utah



June 8 & 9, 2015 Stratospheric Ozone Event

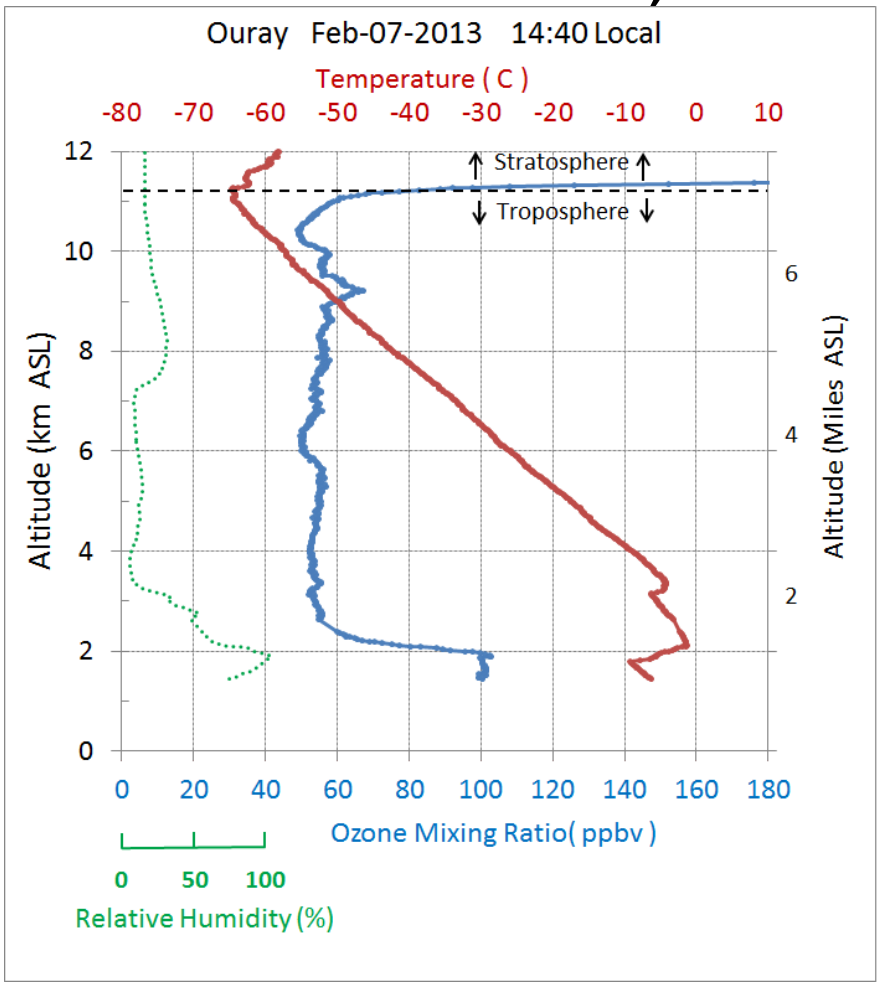
- 2013-2015 Ozone Design Values: 68 to 79 ppb
- 2014-2016 Preliminary Ozone Design Values: 71 to 81 ppb
  - EPA proposed breakpoint for Marginal-Moderate Classification: 81 ppb (November 2, 2016)
- Utah State University Bingham Research and Development Center identified June 8 & 9, 2015 as likely stratospheric ozone exceedances of the 2015 ozone NAAQS
- The Ute Indian Tribe asked EPA Region 8 for assistance in developing an exceptional event demonstration for the two day event
- That demonstration provides the case study for today

Structure of the Atmosphere



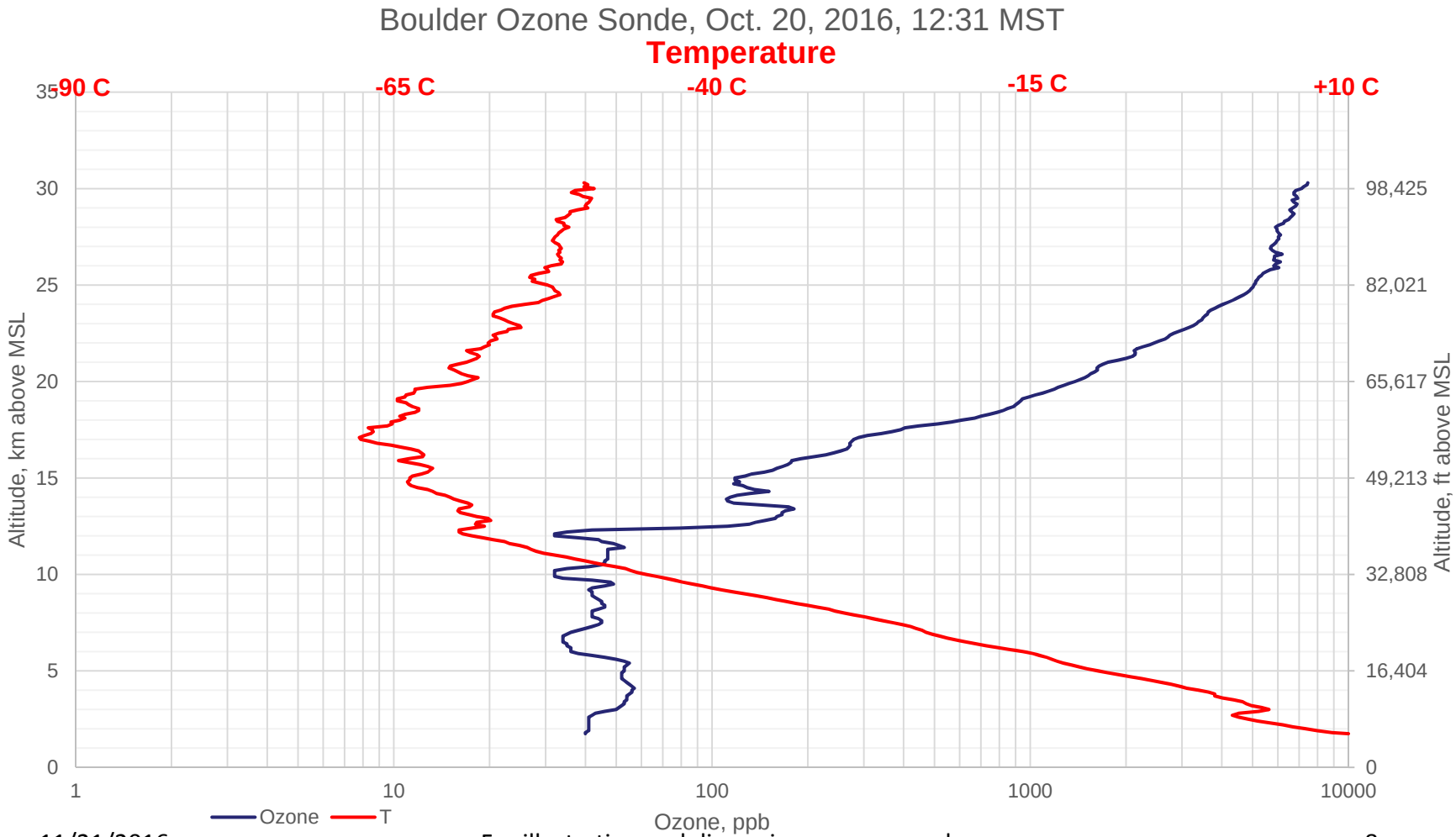
http://www.meteor.iastate.edu/gccourse/atmos/images/image7.gif

Uinta Basin Ozone Sonde, February 7, 2013



NOAA Earth Systems Research Laboratory, Global Monitoring Division
ftp://ftp.cmdl.noaa.gov/ozwv/

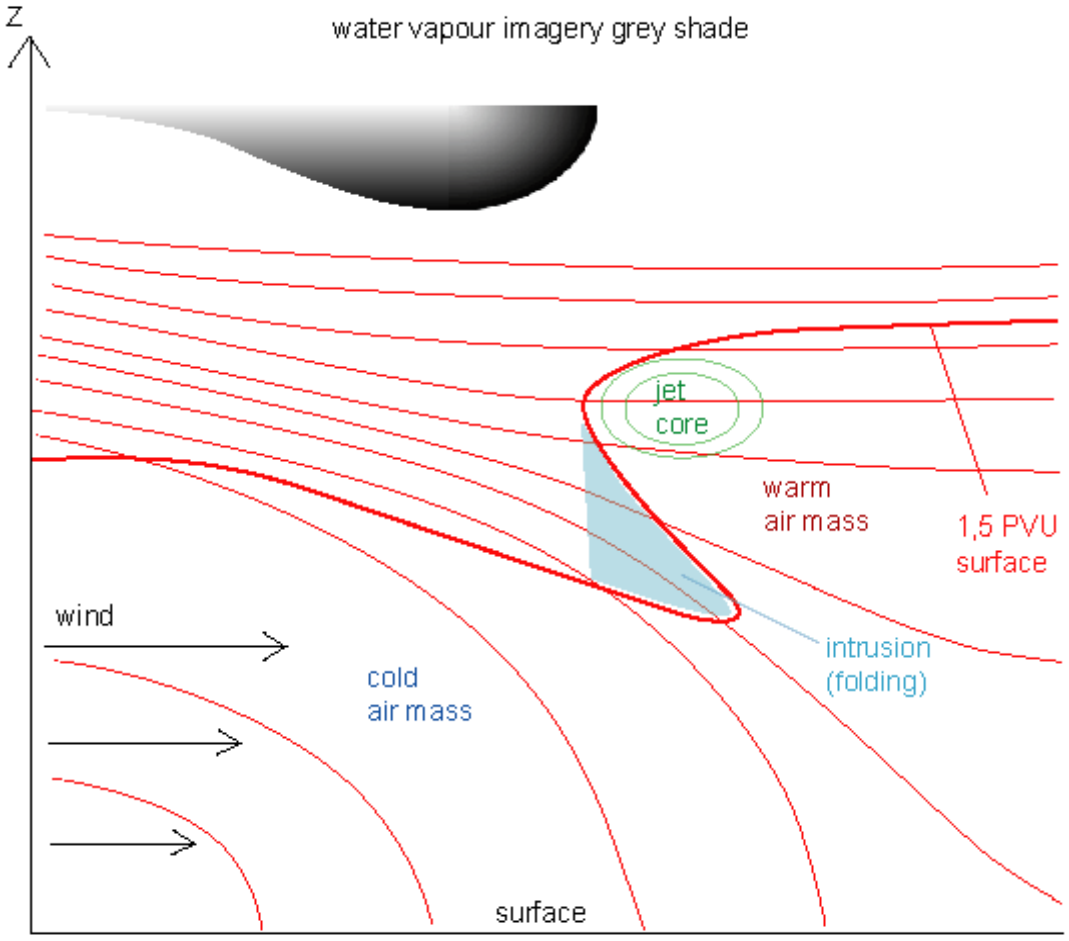
Boulder, Colorado Ozone Sonde, Oct. 20, 2016, 12:31 pm MST



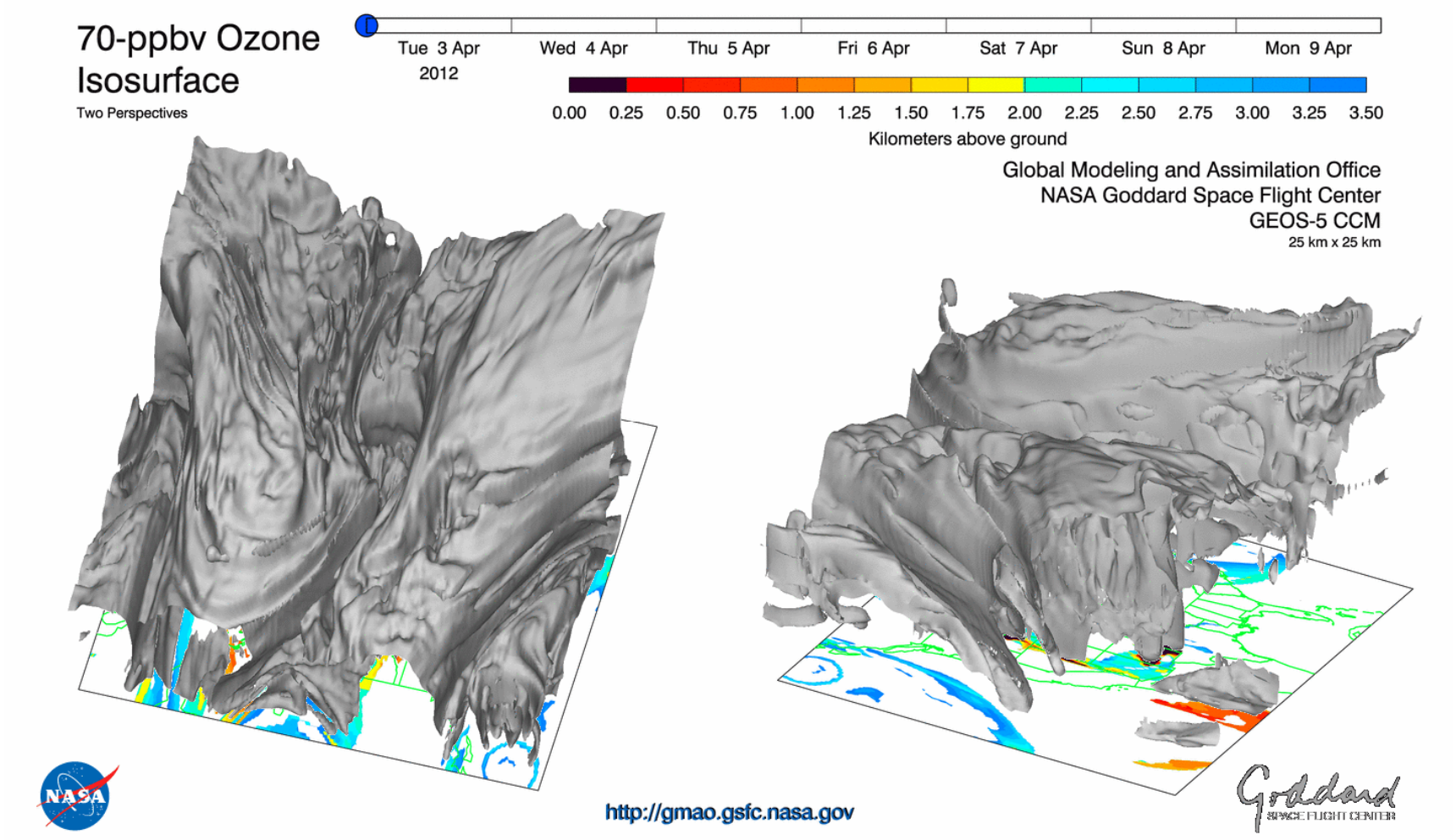
For illustration and discussion purposes only

NOAA Earth Systems Research Laboratory,
Global Monitoring Division
ftp://ftp.cmdl.noaa.gov/ozwv/

Structure of a Tropopause Fold



http://www.eumetrain.org/data/3/33/para3.htm


70-ppbv Ozone Isosurface
Two Perspectives
Tue 3 Apr 2012
Wed 4 Apr
Thu 5 Apr
Fri 6 Apr
Sat 7 Apr
Sun 8 Apr
Mon 9 Apr
0.00 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 3.00 3.25 3.50
Kilometers above ground
Global Modeling and Assimilation Office
NASA Goddard Space Flight Center
GEOS-5 CCM
25 km x 25 km
http://gmao.gsfc.nasa.gov
Goddard
SPACE FLIGHT CENTER

SI EE Demonstration Elements

- Conceptual Model
- Clear Causal Relationship
  - Comparison to Historical Data
  - Meteorology
  - Evidence of Stratospheric Intrusion
  - Clear Causal Relationship Conclusion
- Natural Event
- Not Reasonably Controllable or Preventable
- Conclusion

June 8-9, 2015 Conceptual Model

- Uinta Basin is a winter ozone area
  - Historically, high ozone Dec-March, non-exceedance ozone April-November
- 2015: No winter snow/ozone; highest ozone June 8 & 9
  - June 8 & 9 ozone in Uinta Basin of Utah highest June levels ever observed at most monitors
- June 2-June 10, 2015 relatively high ozone (8-hour average 60 to 77 ppb) at numerous intermountain west high elevation (6,641 to 10,445 feet) ozone monitors
- Beginning June 4, an upper level low pressure system slowly moved east from California to the Great Lakes
  - June 8 & 9, an elongated trough extended from the Great Lakes low to the Pacific coast
- Satellite based ozone measurements showed elevated total atmospheric column ozone coincident with the elongated trough, particularly over Utah
- Stratospheric ozone intrusion therefore caused the ozone exceedances in the Uinta Basin on June 8 and 9, 2015, not local emissions and normal photochemistry

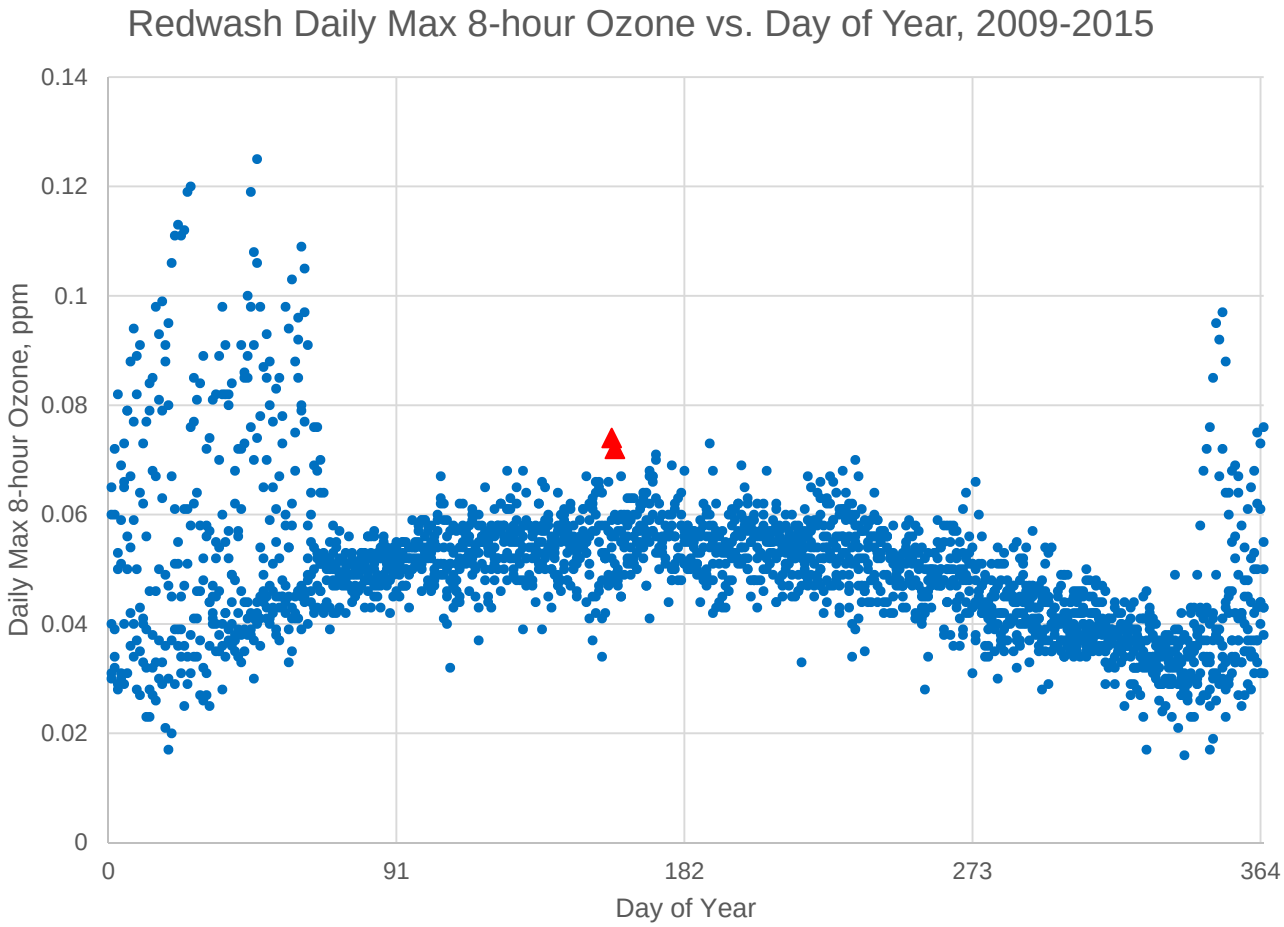
Clear Causal Relationship: Comparison to Historical Data

- Calculated standard suite of statistics for June 8 & 9:
  - Percentiles and Ordinal ranks
    - Considering all data and just April-June data
  - Means
    - Considering all data and just April-June data
  - Standard Deviations
    - Considering all data and just April-June data
- Used Graphical comparisons

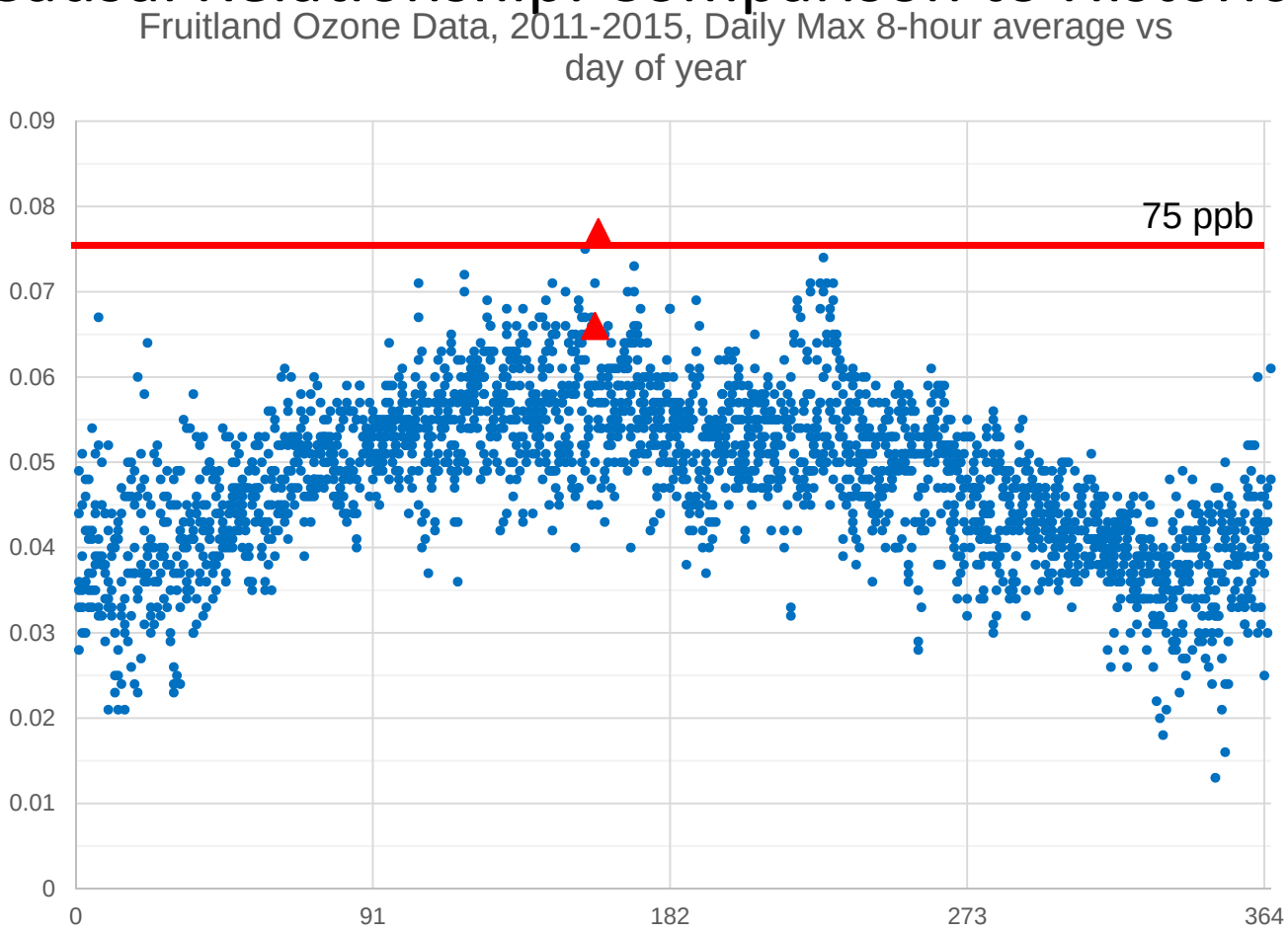
Ordinal Ranking of June 8 & 9, 2015 Ute Indian Tribe Data, April-June Historical

Site	Data Period	June 8 Ordinal Rank	June 9 Ordinal Rank
Ouray	2010-2015	4th of 514	5th of 514
Redwash	2010-2015	1st of 542	2nd of 542
Myton	2011, 2013-2015	2nd of 364	1st of 364
Whiterocks	2011, 2013-2015	1st of 362	2nd of 362

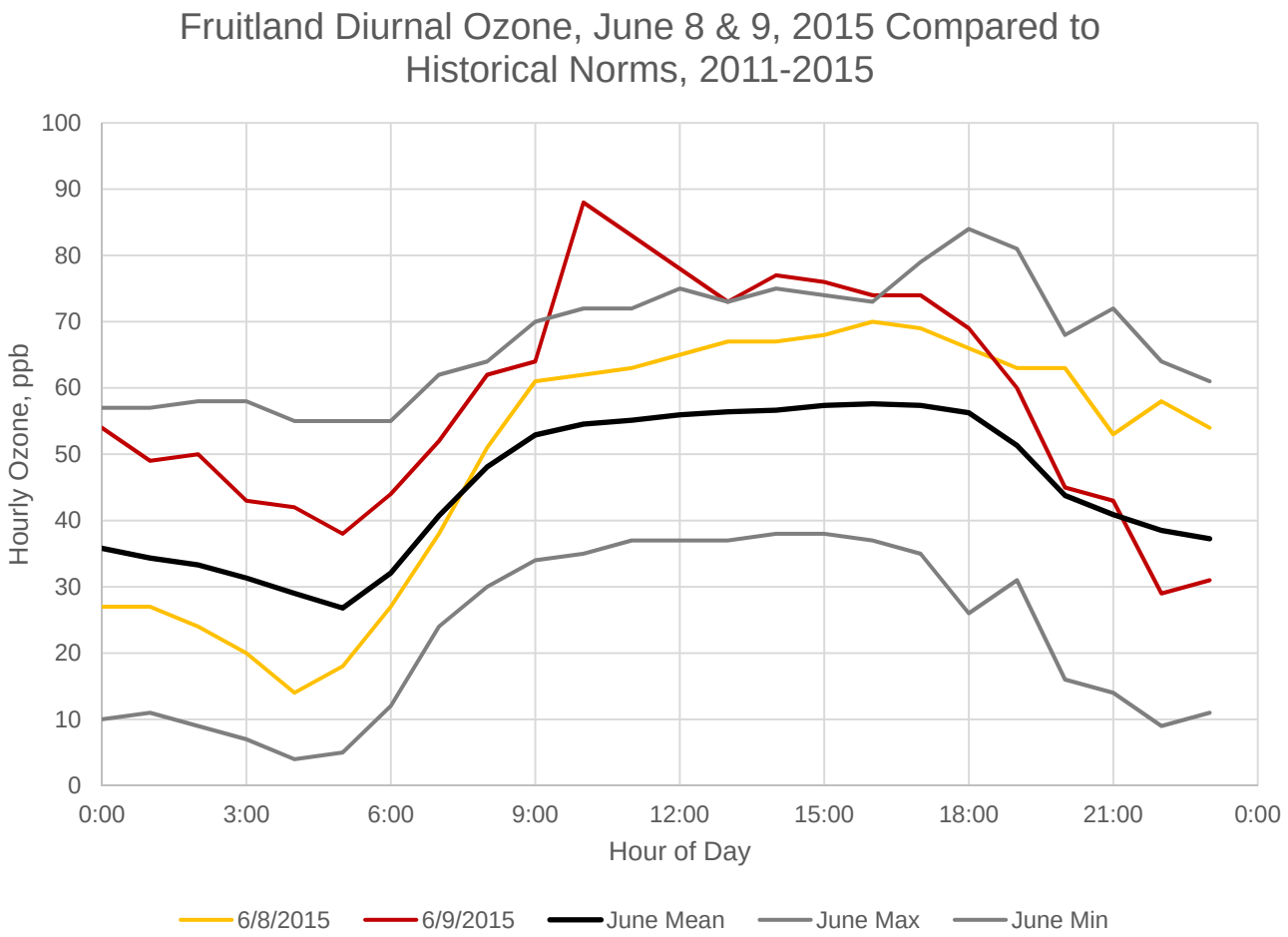
Clear Causal Relationship: Comparison to Historical Data



Clear Causal Relationship: Comparison to Historical Data



Clear Causal Relationship: Comparison to Historical Data



Comparison to Historical Data Summary

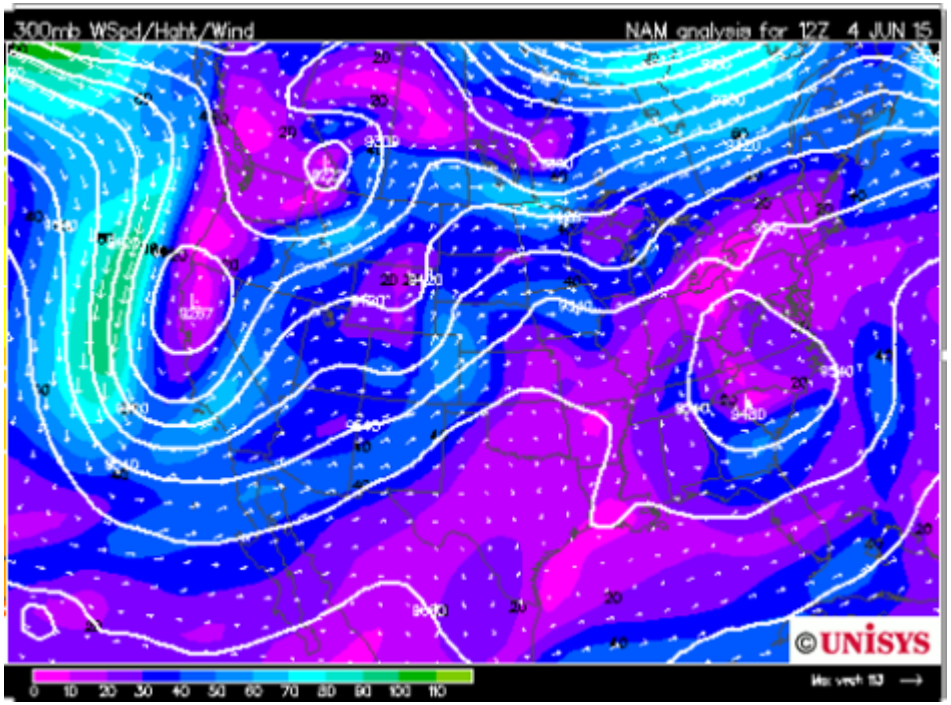
- June 8 & 9, 2015 were the 1st and 2nd highest April-June ozone days at 3 of the 4 Ute Indian Tribe ozone monitors, considering data back to 2010
- The diurnal profile for ozone on June 8 & 9, 2015 showed anomalous high ozone before noon, and had hours of higher than historically observed ozone throughout the day
- Establishes context for the remaining evidence

Clear Causal Relationship: Meteorology

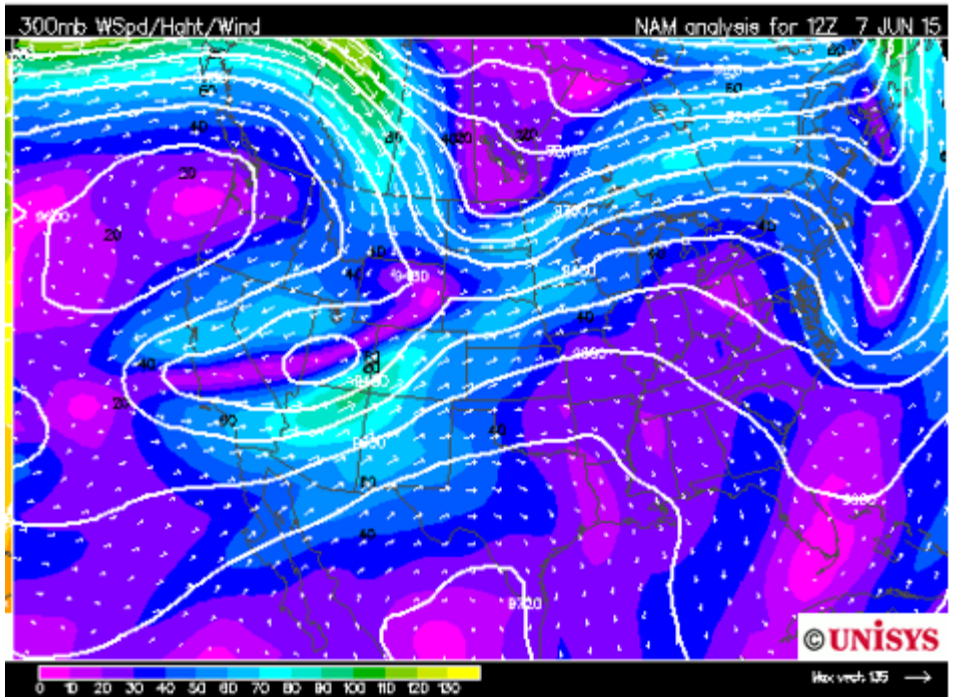
- June 8 & 9, 2015 surface winds were light and variable
- Temperatures were relatively high, mid-80s
- Upper Air Charts
- Can we find a method to compare June 8 & 9 ozone and meteorology to similar historical days?

June 4 and June 7 Upper Air Charts

June 4, 5:00 am MST
Trough down the Pacific coast



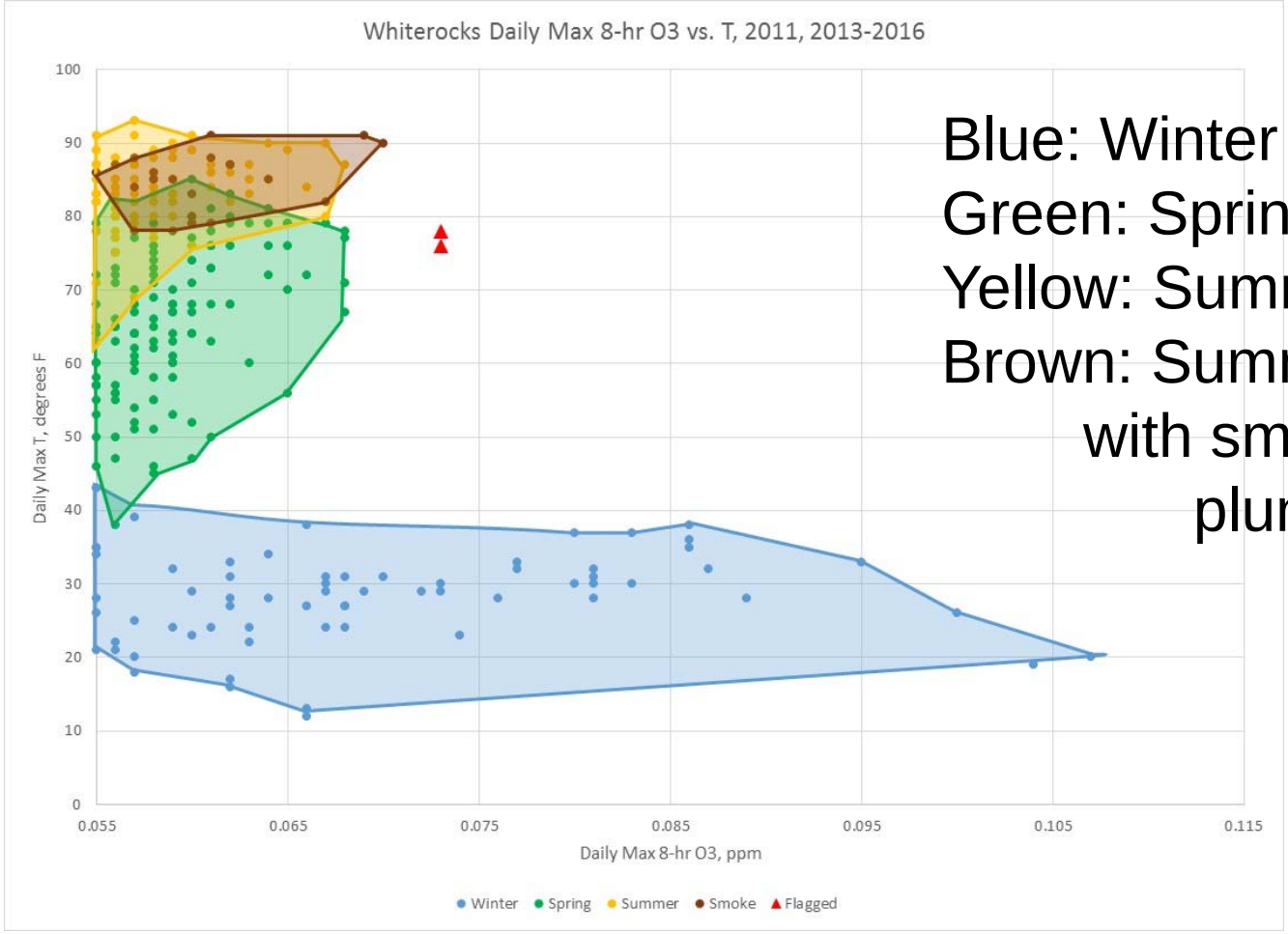
June 7, 5:00 am MST, Trough in south central Canada, narrow extension to the Pacific coast



Comparing Meteorology and Ozone to Historical Days

- Options?
- Multivariate regression models
  - Consider numerous meteorology variables, select optimum set for predictive power
  - Challenges
    - Would want to do seasonal models, exclude winter ozone days
    - Regression coefficients tend to overly influenced by “normal days”, 40 to 60 ppb with little or no local photochemistry
    - Regressions tend to have greatest predictive strength at the middle of the distribution, weakest at the top
    - Here, we have measured ozone outside the range of historical days, may be decoupled from the historical data set
- As an alternative, can we do a binary comparison of ozone and key met parameters?

Binary Comparison of Daily Max 8-hour O_3 and T



Blue: Winter
Green: Spring
Yellow: Summer
Brown: Summer with smoke plumes

Clear Causal Relationship: Evidence of Stratospheric Intrusion

- Observations
  - Satellite Total Column Ozone and Carbon Monoxide
  - Twice daily upper air balloon soundings (T and RH)
- Models
  - Forecast and reanalysis models of
    - Tropopause Height
    - Atmospheric Chemistry
- Characteristics of Stratospheric Air
  - Elevated O_3
  - Low in carbon monoxide, relative humidity
  - Elevated IPV, PT

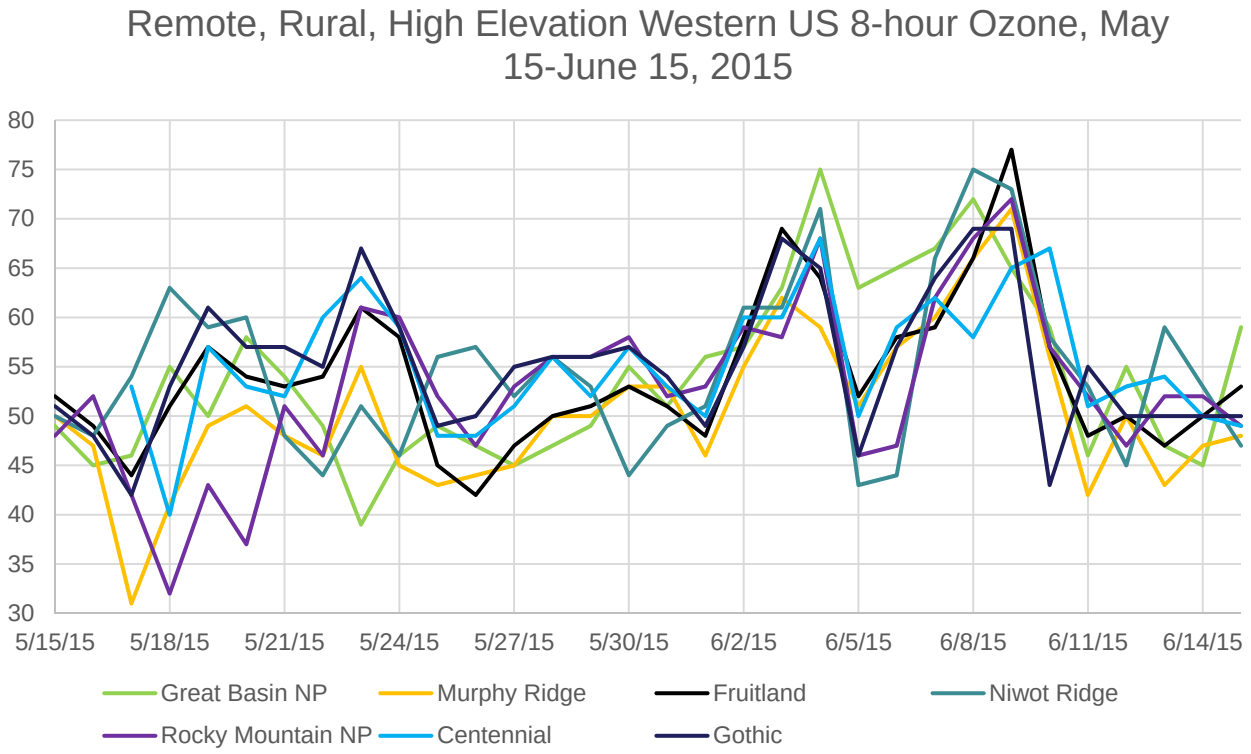
Clear Causal Relationship: Evidence of Stratospheric Intrusion

- Elevated IPV, PT*
  - **IPV**: "IPV [isentropic potential vorticity] is a proxy for atmospheric spin and is a conservative property [*A property with values that do not change in the course of a particular series of events*] with values of up to two orders of magnitude [100 times] greater for stratospheric air than that of tropospheric air (from Shapiro 1980). Therefore, IPV can serve as a tracer of stratospheric air. One unit of IPV (1-PVU) typically represents the tropopause (Shapiro 1980), and as one ascends beyond the tropopause into the stratosphere, the value of IPV increases correspondingly"
  - **PT**: "Potential temperature is "the temperature that an unsaturated parcel of dry air would have if brought adiabatically and reversibly from its initial state to a standard pressure, p0, typically 100 kPa" (or 1000 mb) (American Meteorological Society 2010). Stratospheric air has much higher values of potential temperature than that of tropospheric air. As stratospheric air penetrates the troposphere, its potential temperature is higher than that of tropospheric air surrounding the SI."

**Exceptional Event Demonstration Package for the Environmental Protection Agency, Big Piney and Boulder, Wyoming Ozone Standard Exceedances June 14, 2012*, Wyoming DEQ, June 2013
https://www.epa.gov/air-quality-analysis/exceptional-events-documents-ozone-wyoming

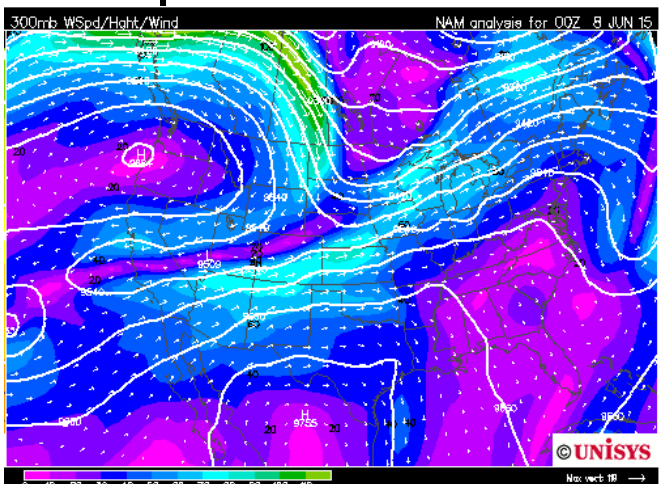
Clear Causal Relationship: Monitor Data

- Diurnal and seasonal ozone profiles
- Spatial distribution of ozone

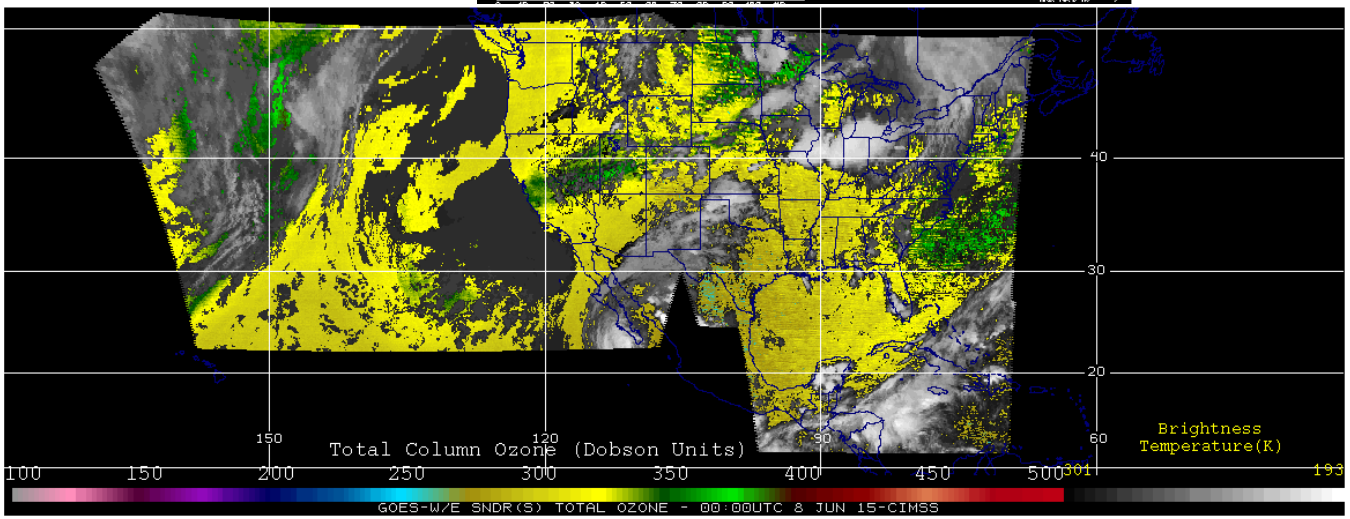


Clear Causal Relationship: Observations: Total Column O_3

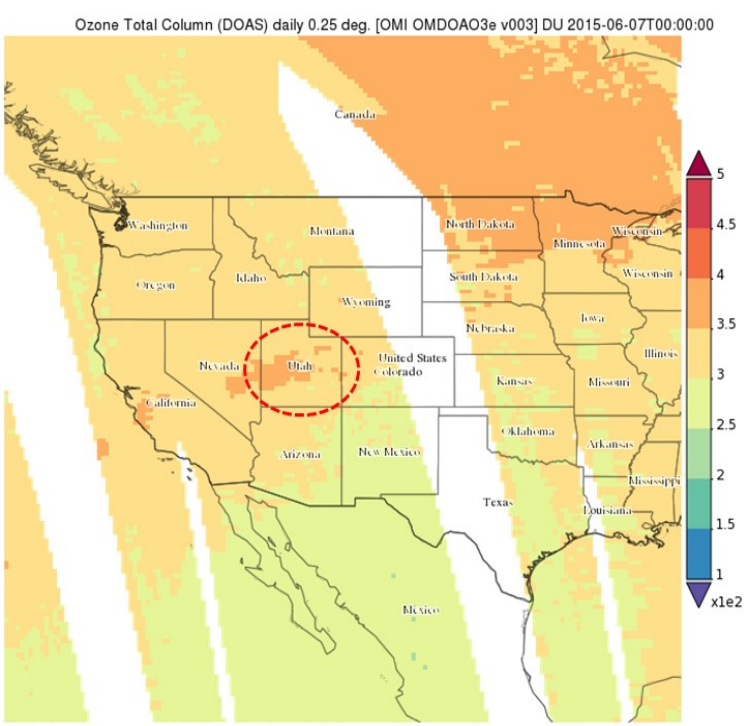
Elevated Total Column O_3 Coincident with Elongated Trough

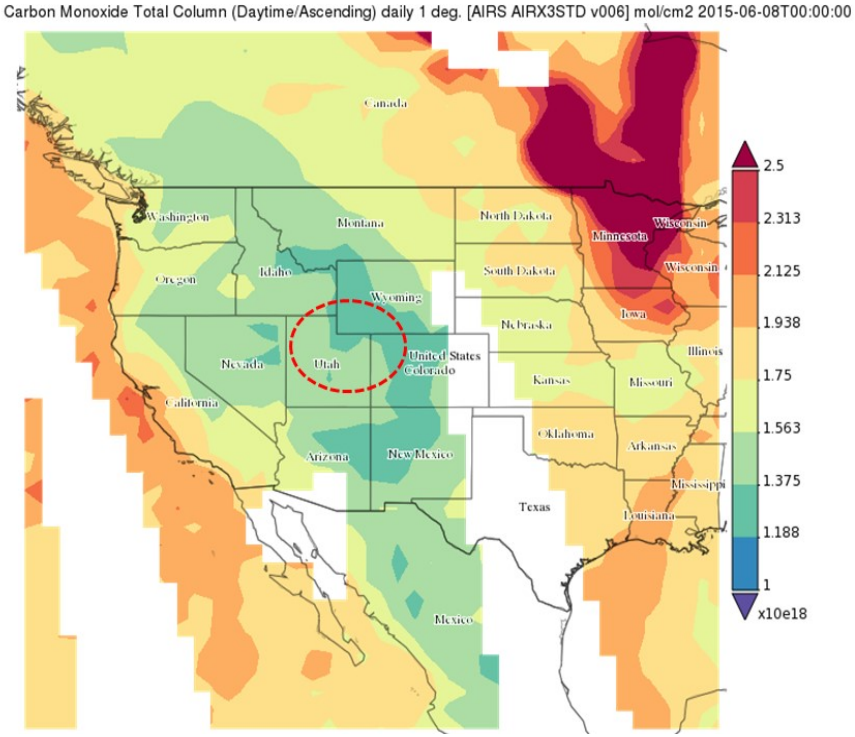


http://weather.unisys.com/archive/eta_init/
https://cimss.ssec.wisc.edu/goes/rt/viewdata.php?product=o3_us



Clear Causal Relationship: Observations: Total Column O_3 & CO





http://giovanni.gsfc.nasa.gov/giovanni/

Clear Causal Relationship: Observations: Upper Atmosphere Soundings

University of Wyoming
College of Engineering
Department of Atmospheric Science

http://weather.uwyo.edu/upperair/sounding.html

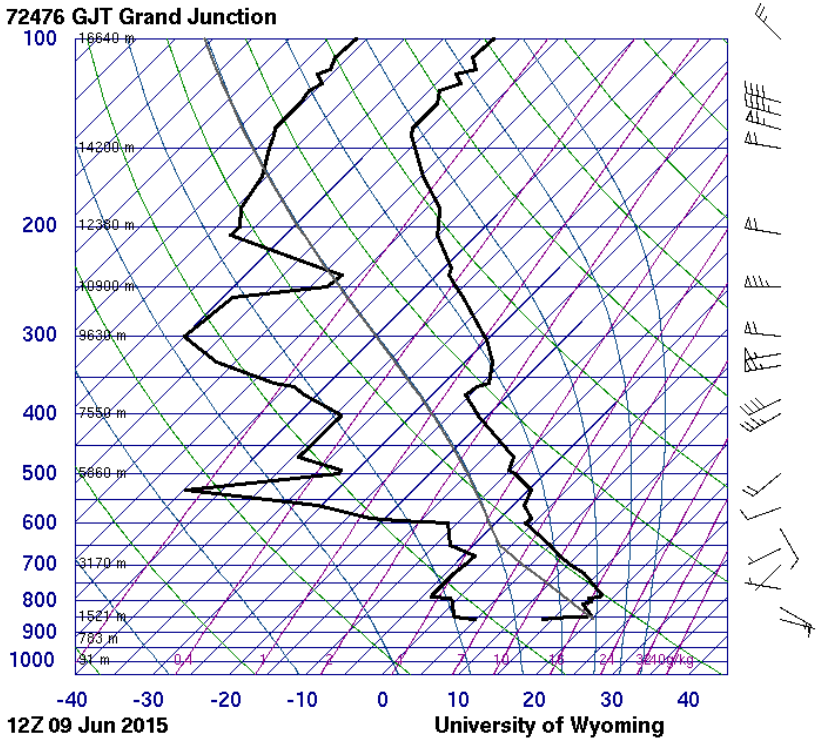
http://vortex.plymouth.edu/myo/upa/raobplt-a.html

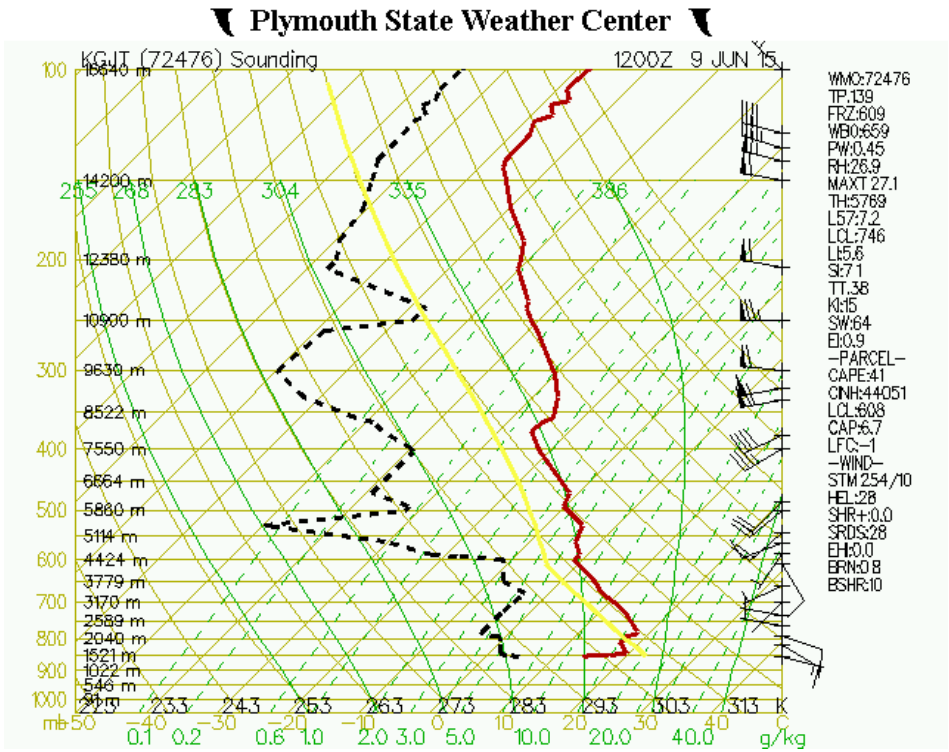
Region	Type of plot	Year	Month	From	To	Station Number
North America	GIF: Skew-T	2015	Jun	06/12Z	10/12Z	78762

Click on the image to request a sounding at that location or enter the station number above.

Include frost point calculations.
Recalculate Data

Clear Causal Relationship: Observations: Upper Atmosphere Soundings





http://weather.uwyo.edu/upperair/sounding.html

http://vortex.plymouth.edu/myo/upa/raobplt-a.html

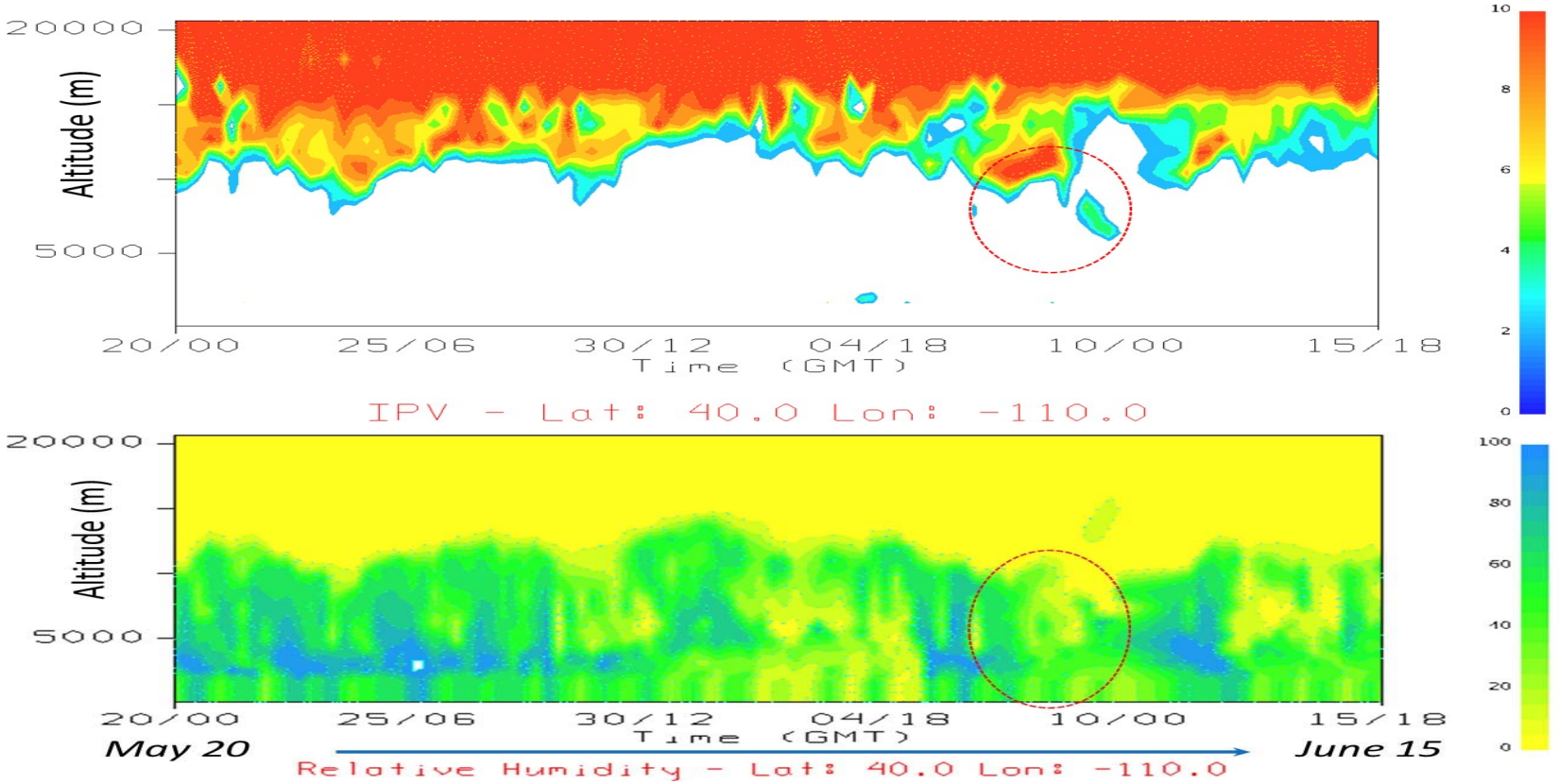
Clear Causal Relationship: Models

- Model Types
  - Forecast vs. Reanalysis
    - Forecast is predictive, extrapolating from a set of observations
    - Reanalysis is retrospective, combining forecast and observations to build best representation of a point in time
  - Meteorology vs. Chemistry
    - Meteorology can look at IPV, PT intrusions, with low RH, tropopause height
    - Chemistry can predict ozone, CO concentrations associated with intrusions

Clear Causal Relationship: Models: Meteorology

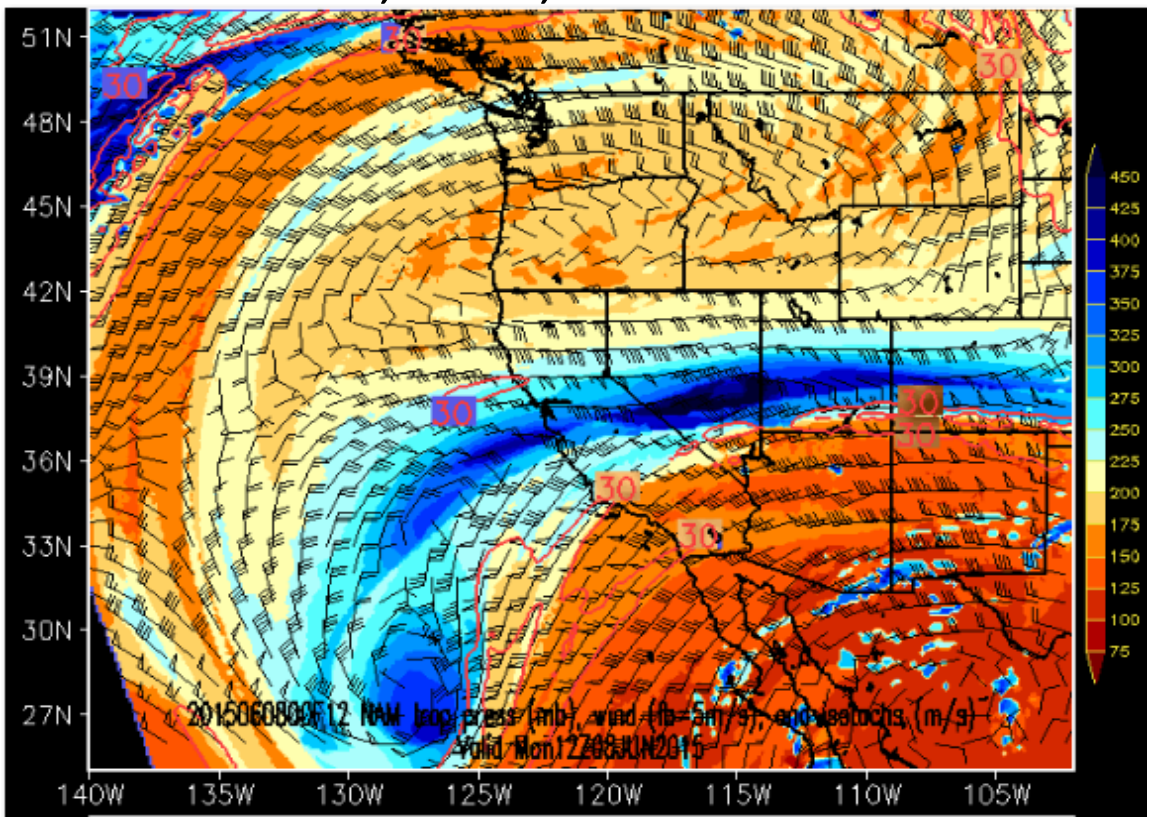
- Forecast Models
  - NAM: North American Mesoscale Model
  - GFS: Global Forecast System
  - RAP: Rapid Refresh
- Reanalysis Models
  - NARR: North American Regional Reanalysis
- Data Archive
  - Digital data files at https://www.ncdc.noaa.gov/data-access/model-data/model-datasets
  - Generally need a data viewer (IDV) to visualize the modeled data
    - IDV: Integrated Data Viewer http://www.unidata.ucar.edu/software/idv/

Clear Causal Relationship: Models: NAM IPV and Relative Humidity, May 20-June 15, 2015



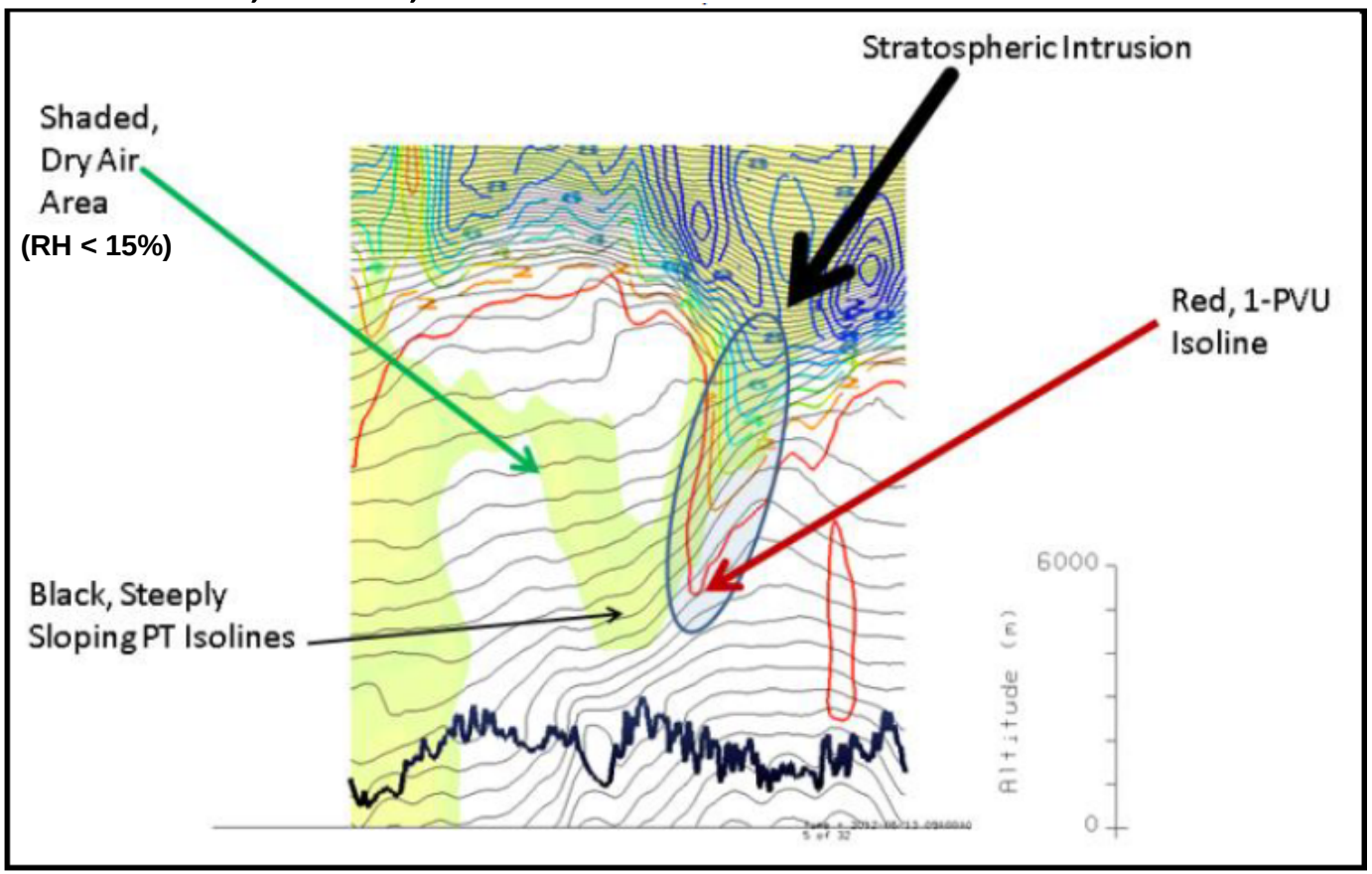
Investigation of Possible Ozone Exceptional Events in June 2015 in the Uintah Basin,
Tran, Huy, Seth Lyman, Trang Tran, Marc Mansfield, Brigham Entrepreneurship & Energy Research Center, Utah State University, April 2016.

Clear Causal Relationship: Models: NAM Tropopause Height, June 8, 2015, 5:00 am MST



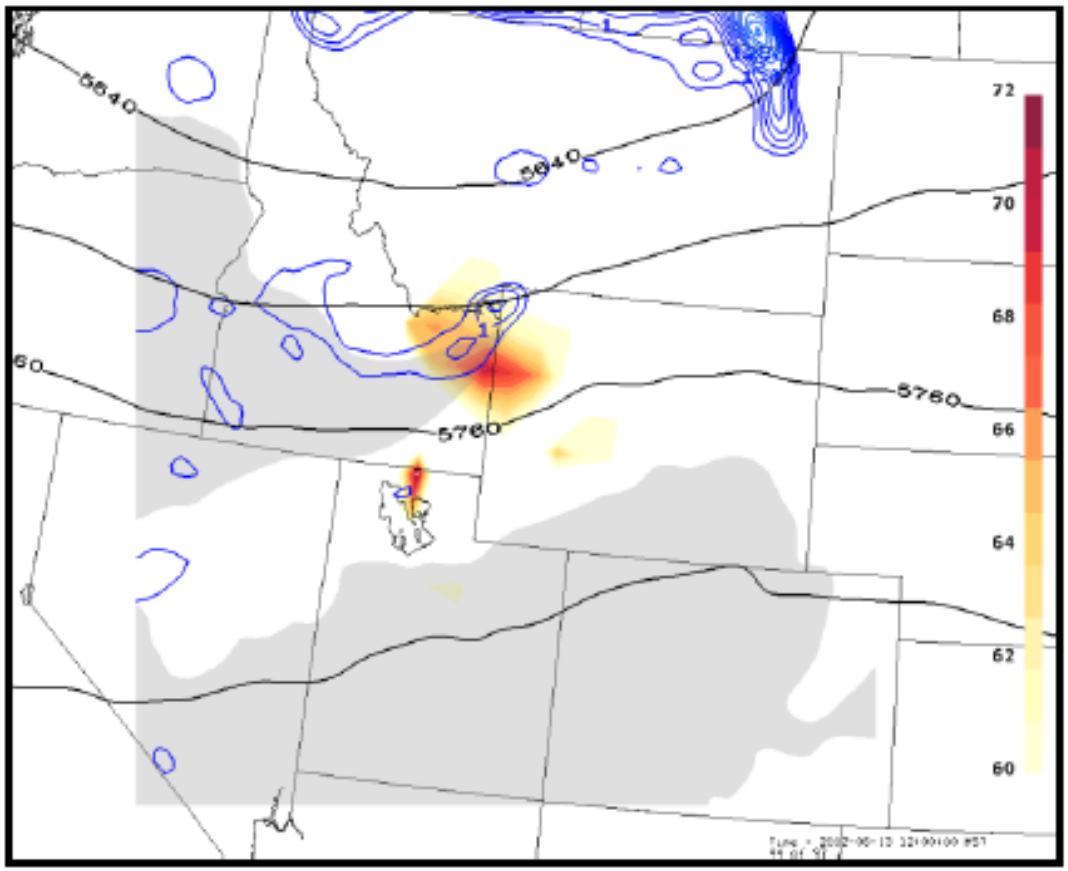
University of Utah, Horel Research Group archived data

Clear Causal Relationship: Models: RAP IPV, PT and RH, June 13, 2012, 9:00 am MST



Exceptional Event Demonstration Package for the Environmental Protection Agency
Big Piney and Boulder, Wyoming Ozone Standard Exceedances June 14, 2012, Wyoming DEQ, June 2013.

Clear Causal Relationship: Models: RAP 600 mb height (m, black),
IPV > 1 at 625 mb (blue), 625 mb RH < 30% (grey) and max 8-hr O3 (orange) June 13, 2012

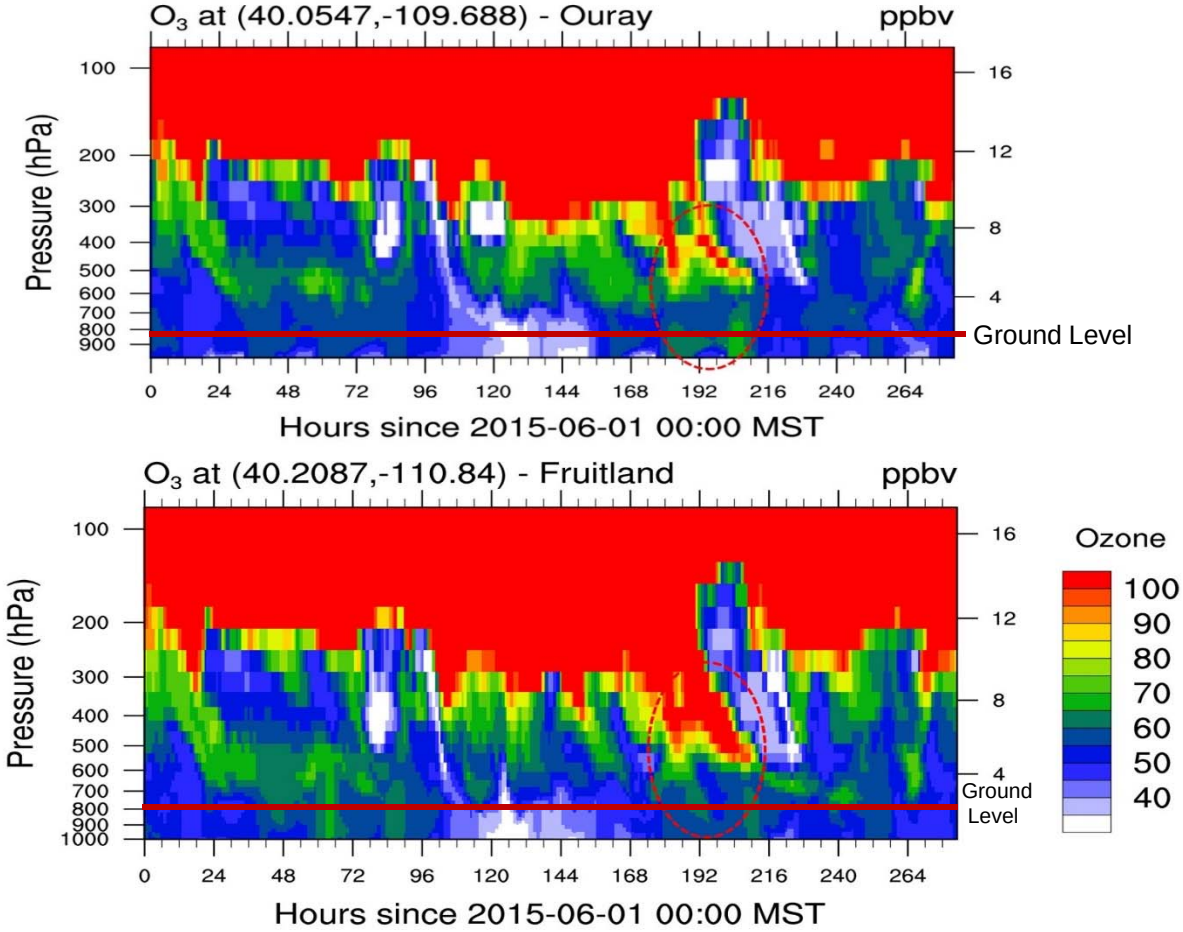


Exceptional Event Demonstration Package for the Environmental Protection Agency
Big Piney and Boulder, Wyoming Ozone Standard Exceedances June 14, 2012, Wyoming DEQ, June 2013.

Clear Causal Relationship: Models: Chemistry

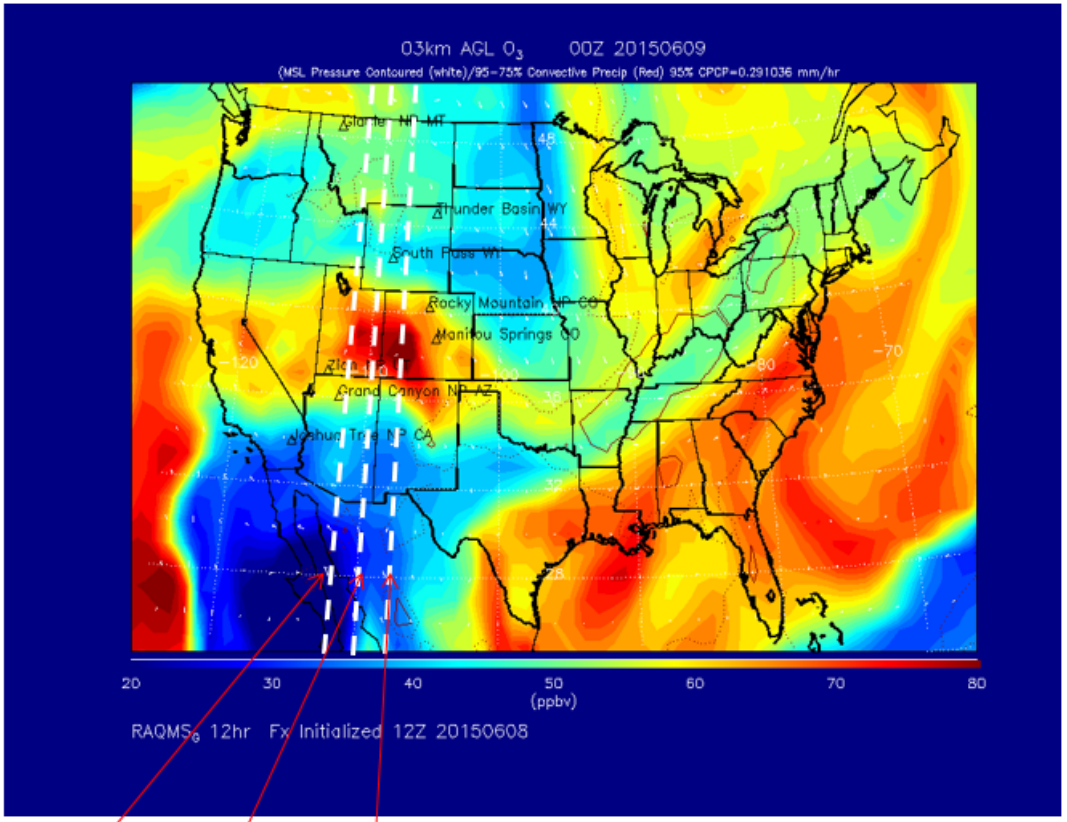
- Chemistry Models
  - **MOZART**: Model for OZone And Related chemical Tracers (NCAR)
  - **GEOS-Chem**: Global chemical transport model (NASA-Harvard-Dalhousie)
  - **RAQMS**: Real-time Air Quality Modeling System (NASA-NOAA-University of Wisconsin)

Clear Causal Relationship: Chemistry Models: GEOS-Chem Modeling of Ozone Above Uinta Basin, June 1-12, 2015



Investigation of Possible Ozone Exceptional Events in June 2015 in the Uintah Basin,
Tran, Huy, Seth Lyman, Trang Tran, Marc Mansfield, Brigham Entrepreneurship & Energy Research Center, Utah State University, April 2016.

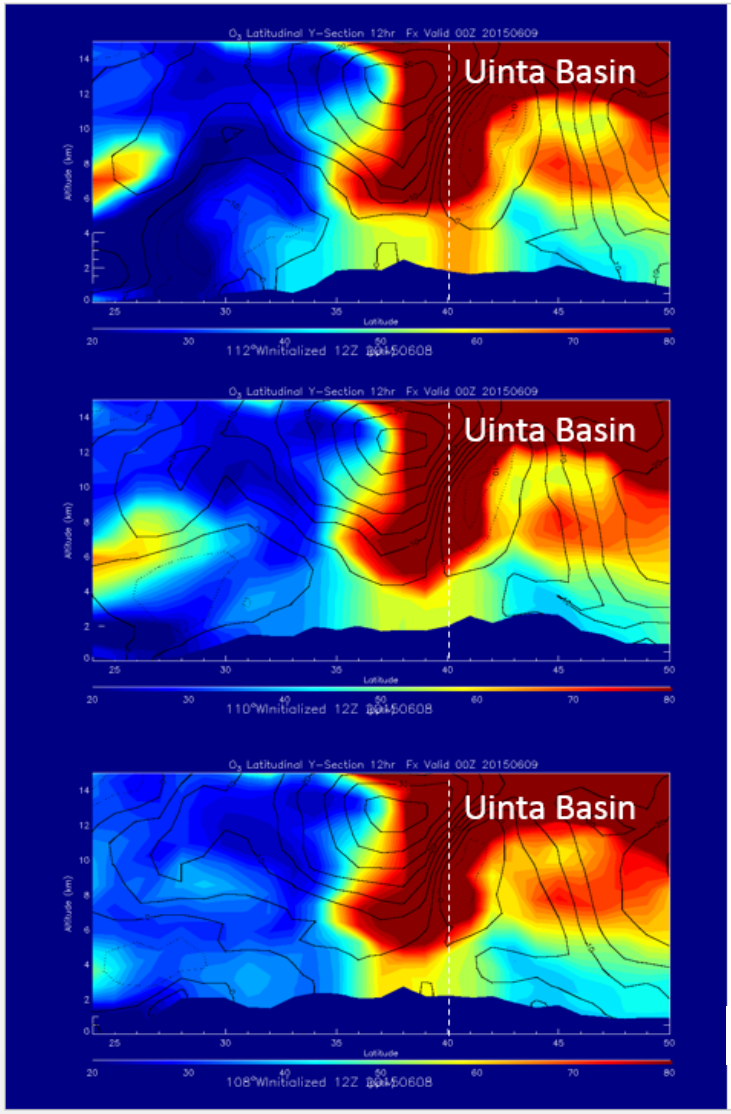
Clear Causal Relationship: Chemistry Models: RAQMS O_3 at 3 km, June 8, 2015, 5:00 am MST



Brad Pierce, NOAA, RAQMS PI

112W 110W 108W

Clear Causal Relationship: Chemistry Models: RAQMS O_3 at 3 km, June 8, 2015, 5:00 am MST



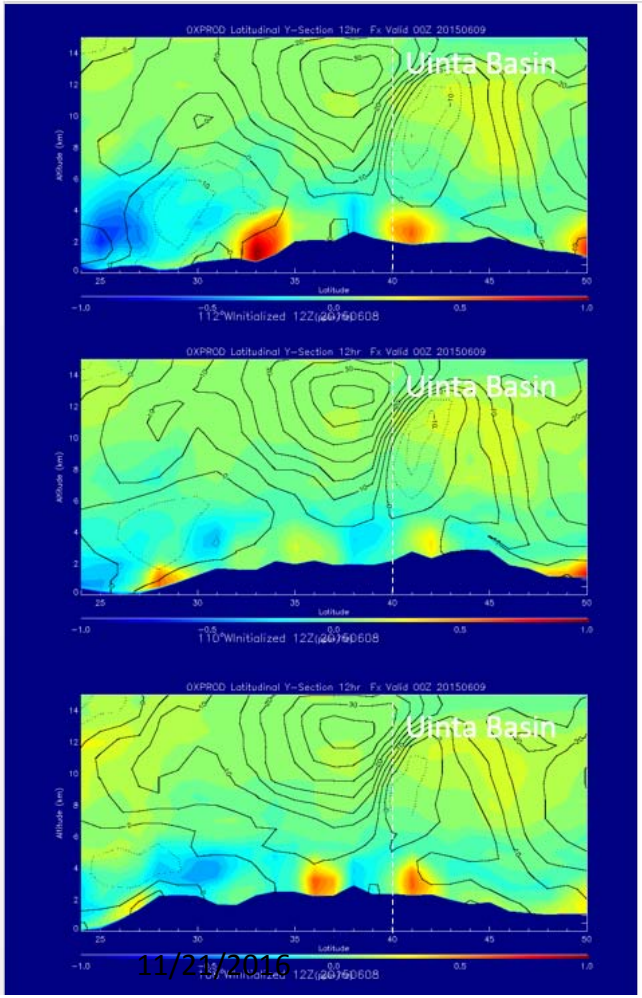
O3 Cross-section 112W
Salt Lake City/Phoenix AZ

O3 Cross-section 110W
24 miles W of Vernal, UT

O3 Cross-section 108W
80 miles E of Vernal, UT
55 miles E of Colorado Border

Brad Pierce, NOAA, RAQMS PI

Clear Causal Relationship: Chemistry Models: RAQMS Net Oxidant Production, June 8, 2015, 5:00 am MST



00Z June 9th, 2015

Net Ox Production Cross-section 112W
Salt Lake City/Phoenix AZ

Net Ox Production Cross-section 110W
24 miles W of Vernal, UT

Net Ox Production Cross-section 108W
80 miles E of Vernal, UT
55 miles E of Colorado Border

Fo Brad Pierce, NOAA, RAQMS PI

Clear Causal Relationship Summary

- Available observation data are consistent with a stratospheric intrusion impacting high elevation rural ozone monitors on June 8 and 9, 2015 in western Utah
  - Seasonal and diurnal ozone data
  - Total column ozone and CO
  - Upper air RH soundings
- Available model output confirm that a strong intrusions occurred over the impacted monitors, with modeled stratospheric ozone reaching ground level
  - NAM IPV and RH
  - GEOS-Chem and RAQMS ozone

Natural Event, Not Reasonably Controllable or Preventable

- Stratospheric intrusions are clearly natural events
- The intrusion is therefore not controllable or preventable
  - A demonstration can state those as facts, if the evidence that the event occurred with a clear causal relationship to exceedances is persuasive

Concluding Remarks

- Ongoing Stratospheric Intrusions Workgroup
  - Open to Government Workers (Federal, State, Local, Tribal)
  - Emphasis on measurements and analytic tools useful for intrusion identification and evaluation
  - Meetings 3rd Tuesday of each month, 10:00 am Mountain Time
    - Nov. 22, Brad Pierce, NOAA RAQMS PI will present RAQMS analysis of June 4-8 SI impacts to the Great Basin National Park monitor
  - Gail Tonnesen, EPA Region 8 is coordinator
    - tonnesen.gail@epa.gov
- The EPA intends to develop guidance to aid in the development of demonstrations for stratospheric intrusions

EXCEPTIONAL EVENTS UPDATES
Case Study: High Wind PM Demonstration

Ruben R. Casso, Engineer
Geographic Strategies Group
Air Quality Policy Division, OAQPS - U.S. EPA
Exceptional Events Workshop
November 2016

Revised Regulatory Structure

The demonstration must include:

(A) A narrative *conceptual model*

(B) Demonstration that the event affected air quality in such a way that there exists a *clear causal relationship* between the specific event and the monitored exceedance or violation

(C) Analysis comparing the event-influenced concentration to concentrations at the same monitoring site at other times

(D) Demonstration of the event was both *not reasonably controllable and not reasonably preventable (nRCP)*

(E) Demonstration that the event was a human activity that is unlikely to recur at a particular location or was a *natural event*

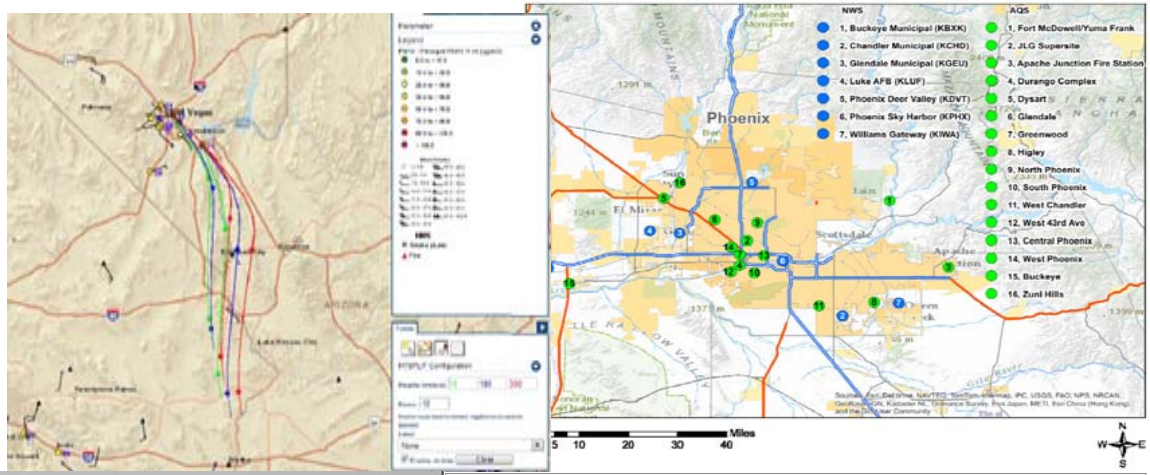
For illustration and discussion purposes only

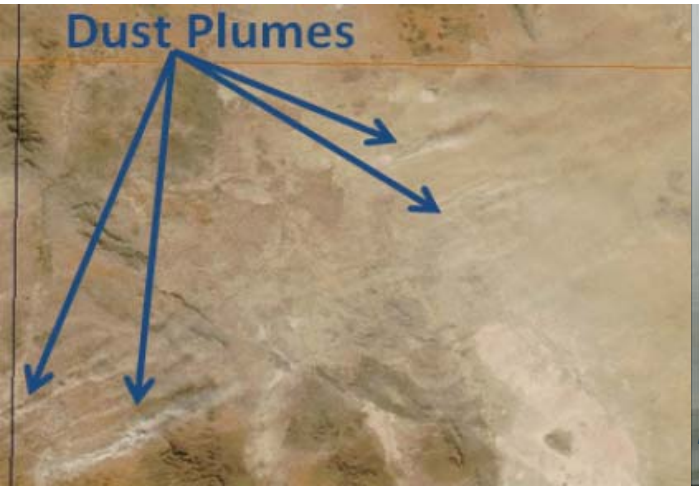
Conceptual Model

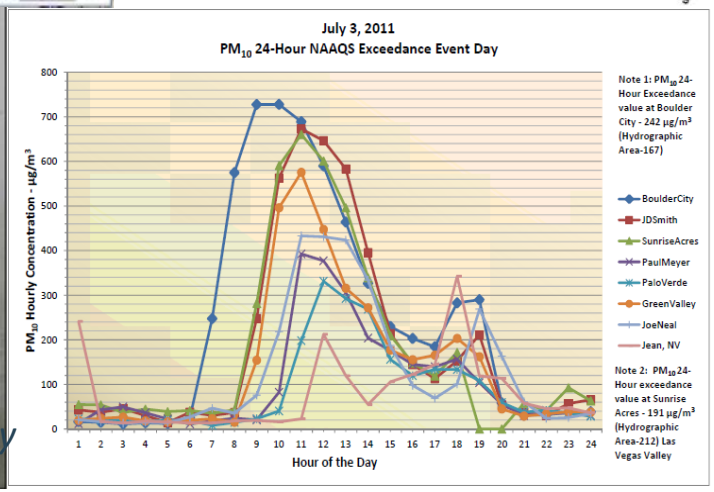
How emissions from the event(s) led to the exceedance or violation at the affected monitor(s);

- Description of the geographic area
- PM monitor locations
- Event specific summary
  - PM concentrations
  - Event cause/winds/impacts/timeframes

PM measurements, maps, satellite/model images, back trajectories; wind data, graphs, photographs, etc.







High Wind Dust Events

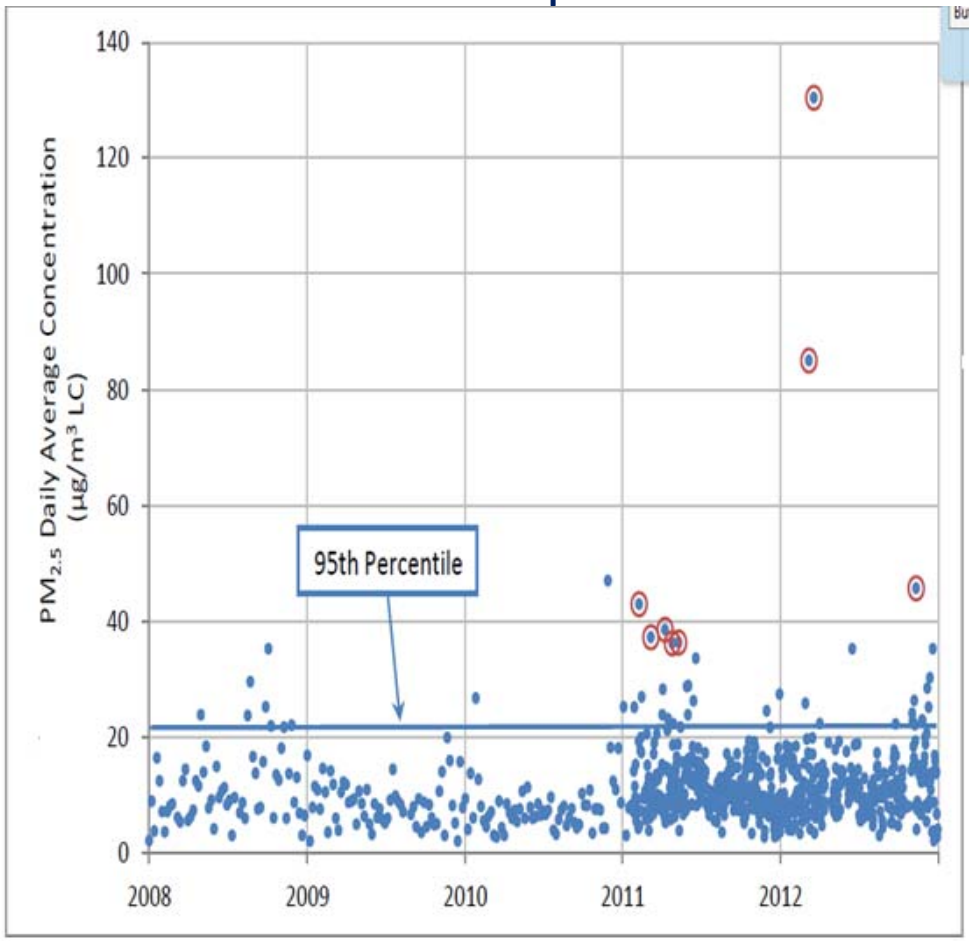
- High wind dust events will be considered natural events in cases where windblown dust is entirely from natural undisturbed lands in the area or where all anthropogenic sources are reasonably controlled.

- EPA will accept a high wind threshold of a sustained wind of 25 mph for areas in the States of… provided this value is not contradicted by evidence in the record at the time the State submits a demonstration

- New rule criteria for large-scale and high-energy high wind dust events

For illustration and discussion purposes only

Comparison of the Claimed Event Concentrations



DEMONSTRATION EXCERPT:

Event In Excess of Normal Historical Fluctuations

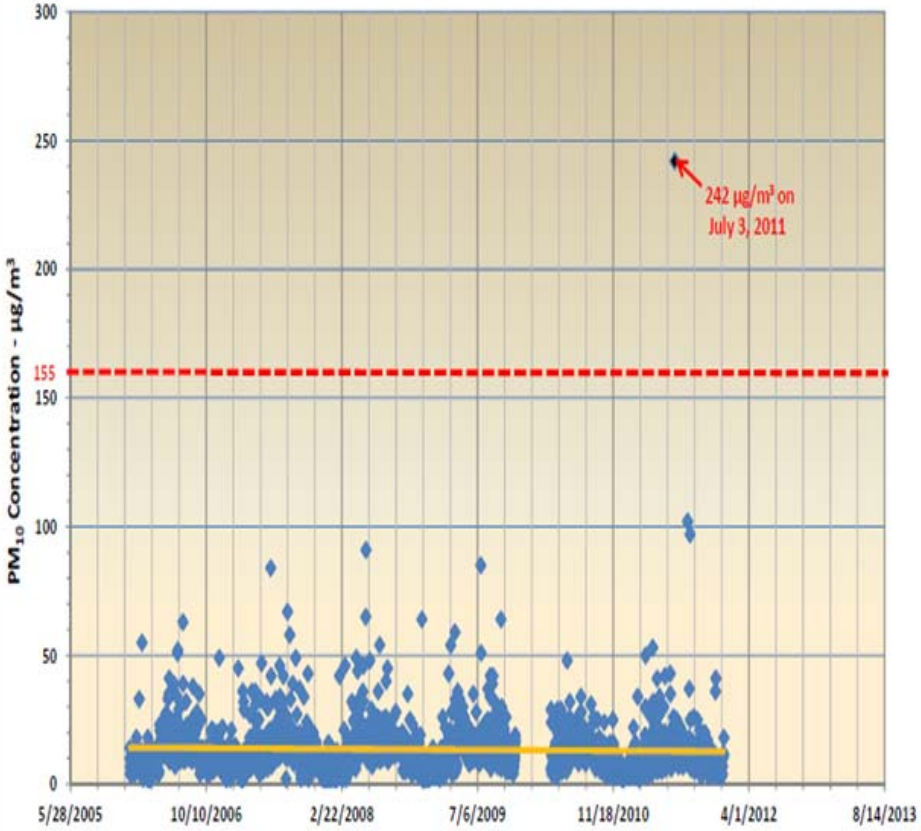
- the flagged $PM_{2.5}$ and PM_{10} concentrations during the proposed exceptional event days were among the **highest** five **percent** of measurements at the affected sites and thus were well above normal historical fluctuations.

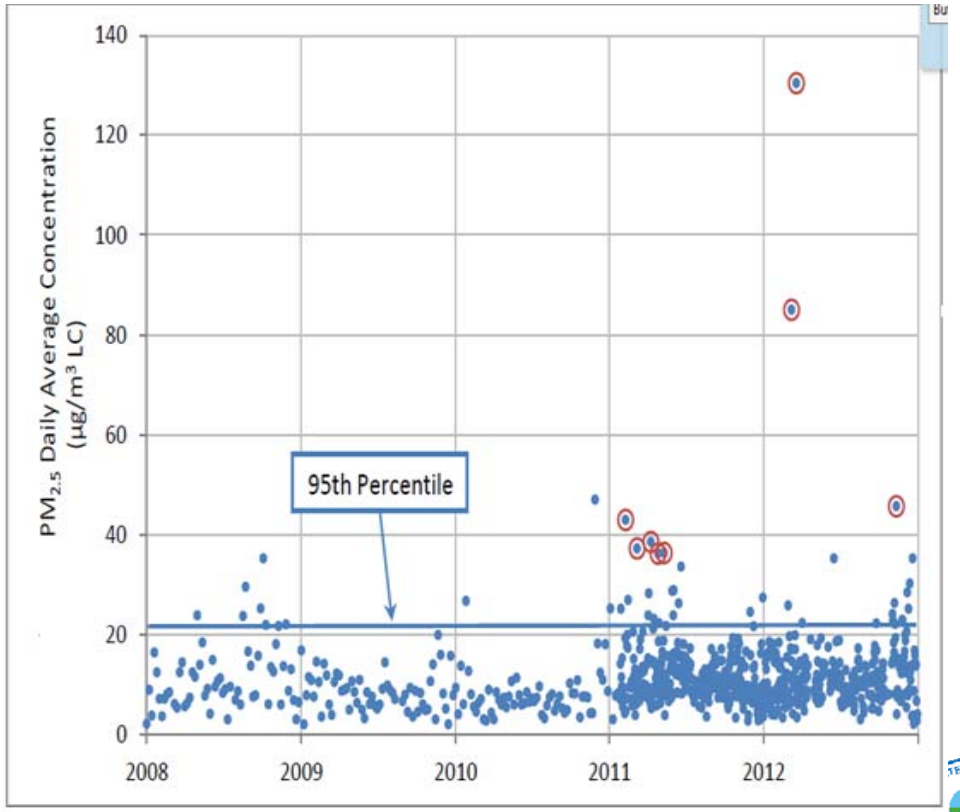
New Rule:

- **Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times** to support the clear causal demonstration requirement. **The Administrator shall not require a State to prove a specific percentile point in the distribution of data**;

For illustration and discussion purposes only

Comparison of the Claimed Event Concentrations to concentrations at the same monitoring site at other times





For illustration and discussion purposes only

Not Reasonably Controllable or Preventable: Evaluation of Reasonable Control

High wind dust events

- EPA will accept a high wind threshold of a sustained wind of 25 mph for areas in the States of… provided this value is not contradicted by evidence in the record at the time the State submits a demonstration

- EPA will consider high wind dust events to be natural events in cases where windblown dust is entirely from natural undisturbed lands in the area or **where all anthropogenic sources are reasonably controlled**

- Dust controls on anthropogenic sources shall be considered reasonable in any case in which the controls render the anthropogenic source as resistant to high winds as natural undisturbed lands in the area

For illustration and discussion purposes only

Not Reasonably Controllable or Preventable: Evaluation of Reasonable Control

- the State must include the following components:
- (A) Identification of the natural and anthropogenic sources of emissions causing and contributing to the monitored exceedance or violation, including the contribution from local sources.
- (B) Identification of the relevant state implementation plan, tribal implementation plan, or federal implementation plan or other enforceable control measures in place for the sources identified in paragraph (b)(8)(vii)(A) of this section and the implementation status of these controls.
- (C) Evidence of effective implementation and enforcement of the measures identified in paragraph (b)(8)(vii)(B) of this section.

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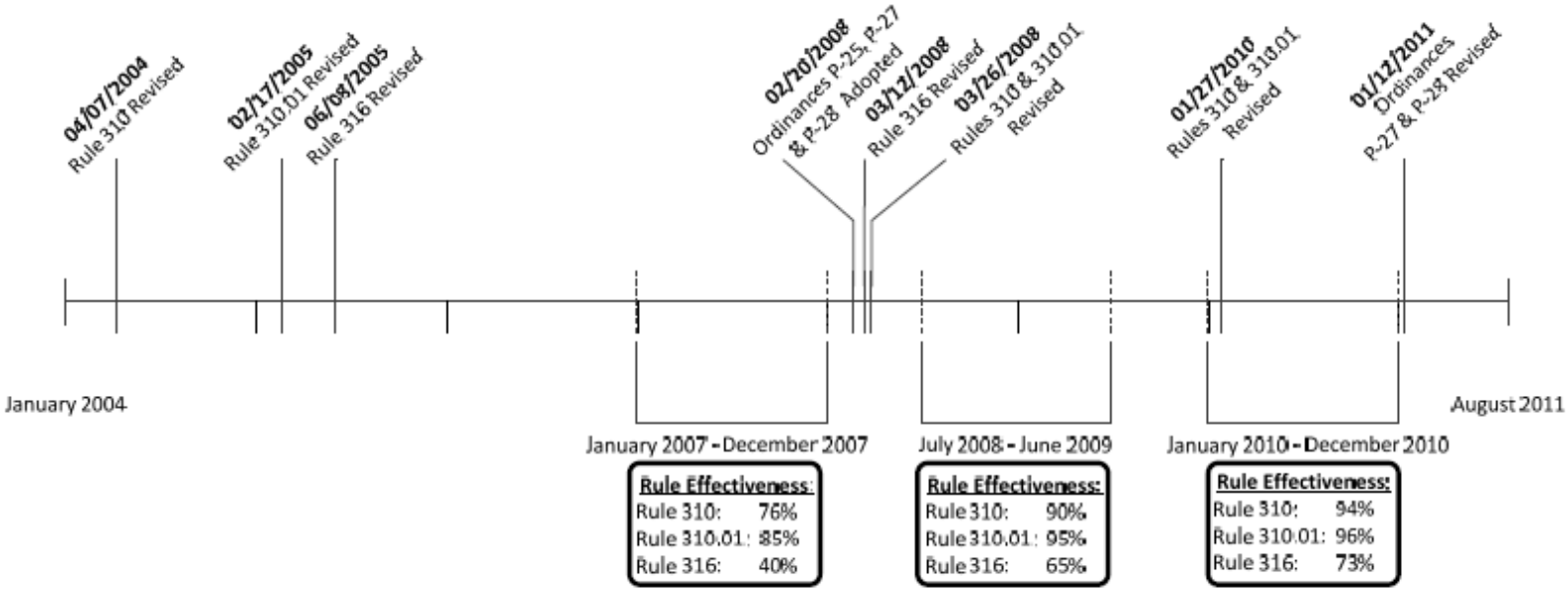
Not Reasonably Controllable or Preventable: SIP Approvals and Control Measures

- Timeline can be helpful
  - SIP approval within 5 years of the event



For illustration and discussion purposes only

Large scale high energy high wind dust events

For illustration and discussion purposes only

Large-scale and high energy high wind dust events

For large-scale and high-energy high wind dust events, the Administrator will generally consider a demonstration documenting the nature and extent of the event to be sufficient with respect to the not reasonably controllable criterion… provided the State provides evidence showing that the event satisfies the following:

- The event is associated with a dust storm and is the focus of a Dust Storm Warning.
- The event has sustained winds that are greater than or equal to 40 miles per hour.
- The event has reduced visibility equal to or less than 0.5 miles.

For illustration and discussion purposes only

Large scale high energy high wind dust events

DATE	PM_{10}	PM_{10}	PM_{10}	PM_{10}	PM_{10}	PM_{10}
2/11/2012	77	45	46	71	158	130
2/14/2012	171	106	167	ND	114	123
2/28/2012	116	183	29	192	276	301
3/2/2012	169	221	52	76	153*	251
3/7/2012	520	482	1098	313	656	610
3/18/2012	1739	1606	646	1449	1691	1261
4/1/2012	96	79	50	53	138	157
4/7/2012	88	60	30	171	80	86
4/14/2012	751	803	927	794	961	880
4/26/2012	259	274	198	464	408	ND
5/23/2012	115	121	86	214	143	163
6/15/2012	167	99	215	75	203	143
11/10/2012	469	396	48	44	230	331
12/14/2012	111	ND	9	16	136	199
12/19/2012	ND	ND	381	397	365	500

Table 1-1. 24-hour average concentrations for high wind blowing dust exceedances.

For illustration and discussion purposes only

Large scale high energy high wind dust events

particulate measurements on exceptional event days.

Type	Method	11/28/2010	02/08/2011	03/07/2011	04/03/2011	04/09/2011	04/26/2011	05/10/2011	03/07/2012	03/18/2012	11/10/2012
$PM_{2.5}$	FRM	37.9	**36.8**		25.2	**48.7**					
$PM_{2.5}$	AC	28.7	23.9	29.0	20.9	28.5	28.2	27.5			20.4
$PM_{2.5}$	FRM	47.0	**42.9**		23.8	**38.5**					
$PM_{2.5}$	FEM		28.4	**37.2**	33.0	33.8	**36.2**	**36.3**	**85.0**	**130.4**	**45.7**
$PM_{2.5}$	AS	47.4		38.7	24.4	26.8			69.1		
$PM_{2.5}$	AC	43.9	35.1	39.1	29.7	32.8	47.0	35.4	71.2	89.2	38.4
$PM_{2.5}$	AC		24.1	44.5	38.7	38.4	80.8	39.8	73.4	109.7	29.4
PM_{10}	FRM	146	114		83	123					
PM_{10}	FRM	84	82		80	114					
PM_{10}	C	159	143	185	120	157	161	111		601	175
PM_{10}	FRM				80	126					
PM_{10}	C	196	147	232	166	152	327	142	385	748	257
PM_{10}	FRM	**249**			**159**	**169**					
PM_{10}	C	251	162	288	167	171	253	131			

For illustration and discussion purposes only

Questions and Comments

REVIEWING OZONE/WILDFIRE EXCEPTIONAL EVENT REQUESTS

SOME THINGS TO LOOK AT

November 2016 Dallas Exceptional Events Implementation Workshop

Mark Sather

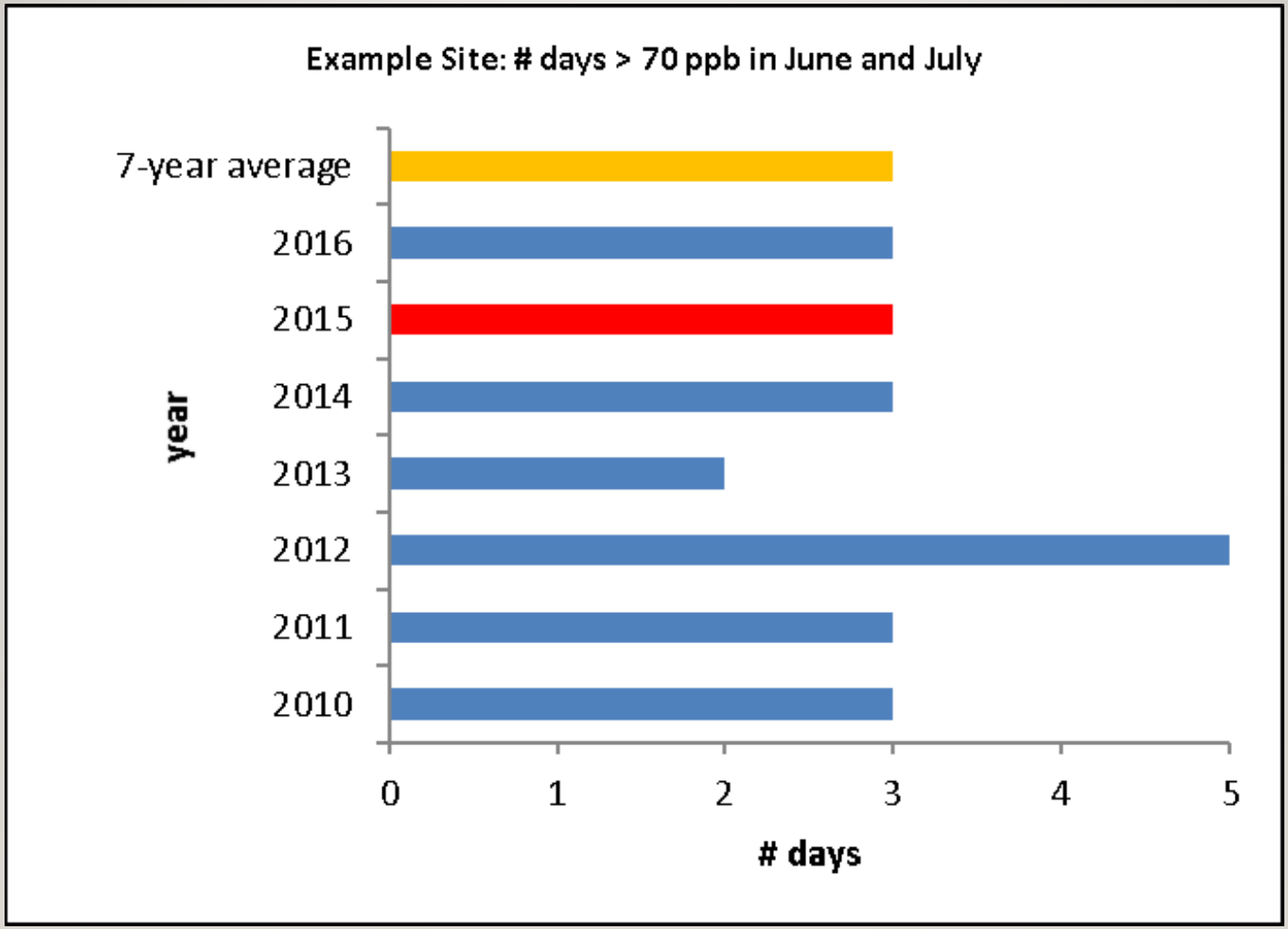
EPA Region 6 Air Monitoring & Grants Section

sather.mark@epa.gov

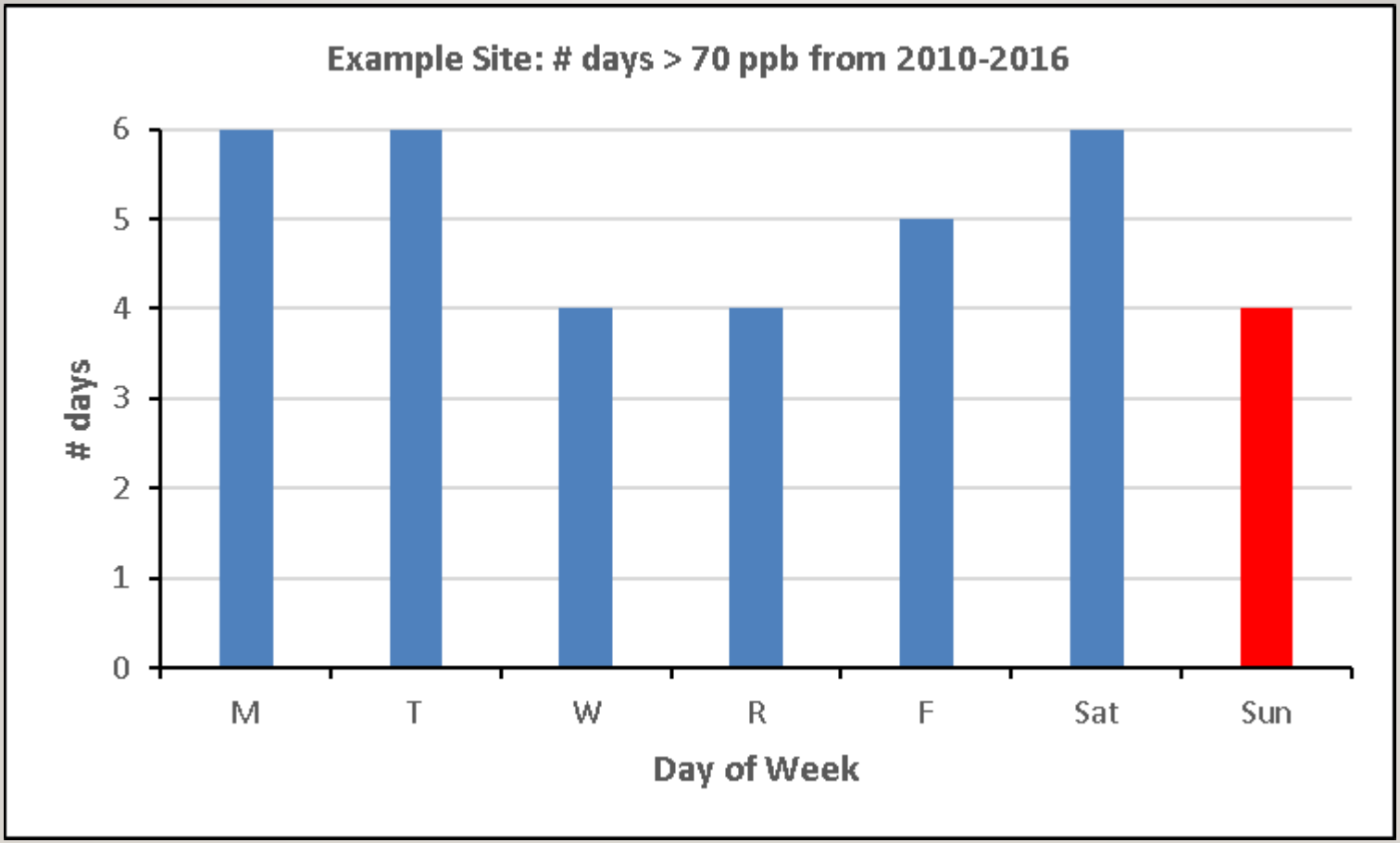
ANALYSES COMPARING THE CLAIMED EVENT-INFLUENCED CONCENTRATION(S) TO CONCENTRATIONS AT THE SAME MONITORING SITE AT OTHER TIMES TO SUPPORT THE CLEAR CAUSAL RELATIONSHIP REQUIREMENT

- **Important to note that all daily maximum 8-hour ozone concentrations in the top 4 for each year at a monitoring site are going to be at the high end of the annual percentile distribution, i.e. at the 99th percentile. So it is important to review closely the 8-hour ozone concentrations within that top percentile of data to see if those concentrations might be unusual.**

- **Example Site Analyses: Comparing 8-hour ozone exceedance concentration data through the years.**


Example Site: # days > 70 ppb in June and July
7-year average
2016
2015
2014
2013
2012
2011
2010
year
0
1
2
3
4
5
days


Example Site: # days >= 77 ppb
7-year average
2016
2015
2014
2013
2012
2011
2010
year
0.0
1.0
2.0
days


Example Site: # days > 70 ppb from 2010-2016
days
0
1
2
3
4
5
6
M
T
W
R
F
Sat
Sun
Day of Week

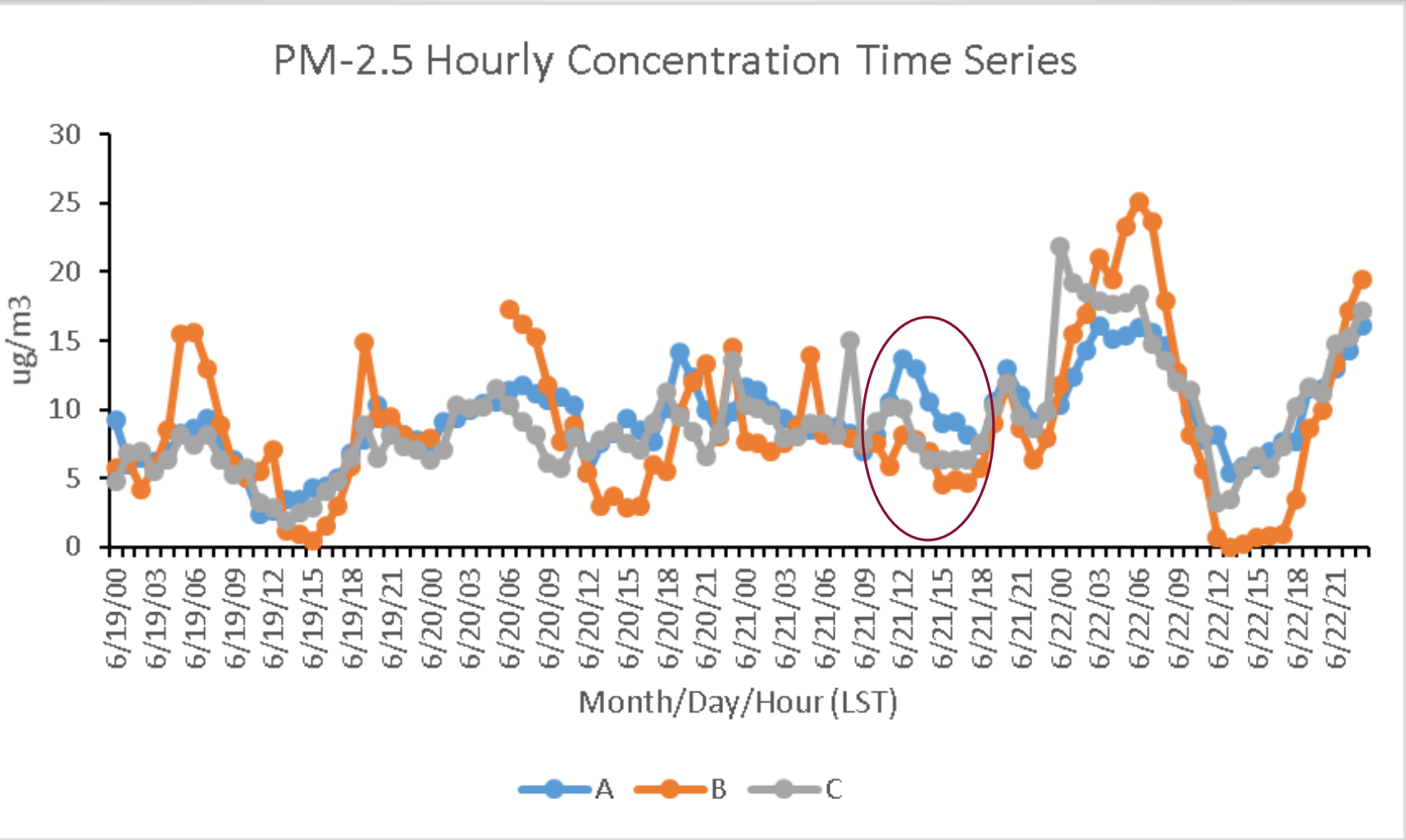
A NARRATIVE CONCEPTUAL MODEL THAT DESCRIBES THE EVENT(S) CAUSING THE EXCEEDANCE OR VIOLATION AND A DISCUSSION OF HOW EMISSIONS FROM THE EVENT(S) LED TO THE EXCEEDANCE OR VIOLATION AT THE AFFECTED MONITOR(S)

A DEMONSTRATION THAT THE EVENT AFFECTED AIR QUALITY IN SUCH A WAY THAT THERE EXISTS A CLEAR CAUSAL RELATIONSHIP BETWEEN THE SPECIFIC EVENT AND THE MONITORED EXCEEDANCE OR VIOLATION

- **Back and Forward Wind Trajectories are not enough; also need clear evidence that any precursor or ozone concentrations from wildfire plume, if those concentrations are still present in plume after long distance transport and dilution, actually mixed down to the ground level monitors.**

- **Example Site Analyses: Look at ground level pollutant concentration time series before, including, and after the claimed event.**

- **Digging a little deeper for NO_x precursors: Look at NO/NO_2 ratio history at monitoring site**


PM-2.5 Hourly Concentration Time Series
ug/m3
30
25
20
15
10
5
0
6/19/00
6/19/03
6/19/06
6/19/09
6/19/12
6/19/15
6/19/18
6/19/21
6/20/00
6/20/03
6/20/06
6/20/09
6/20/12
6/20/15
6/20/18
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6/21/00
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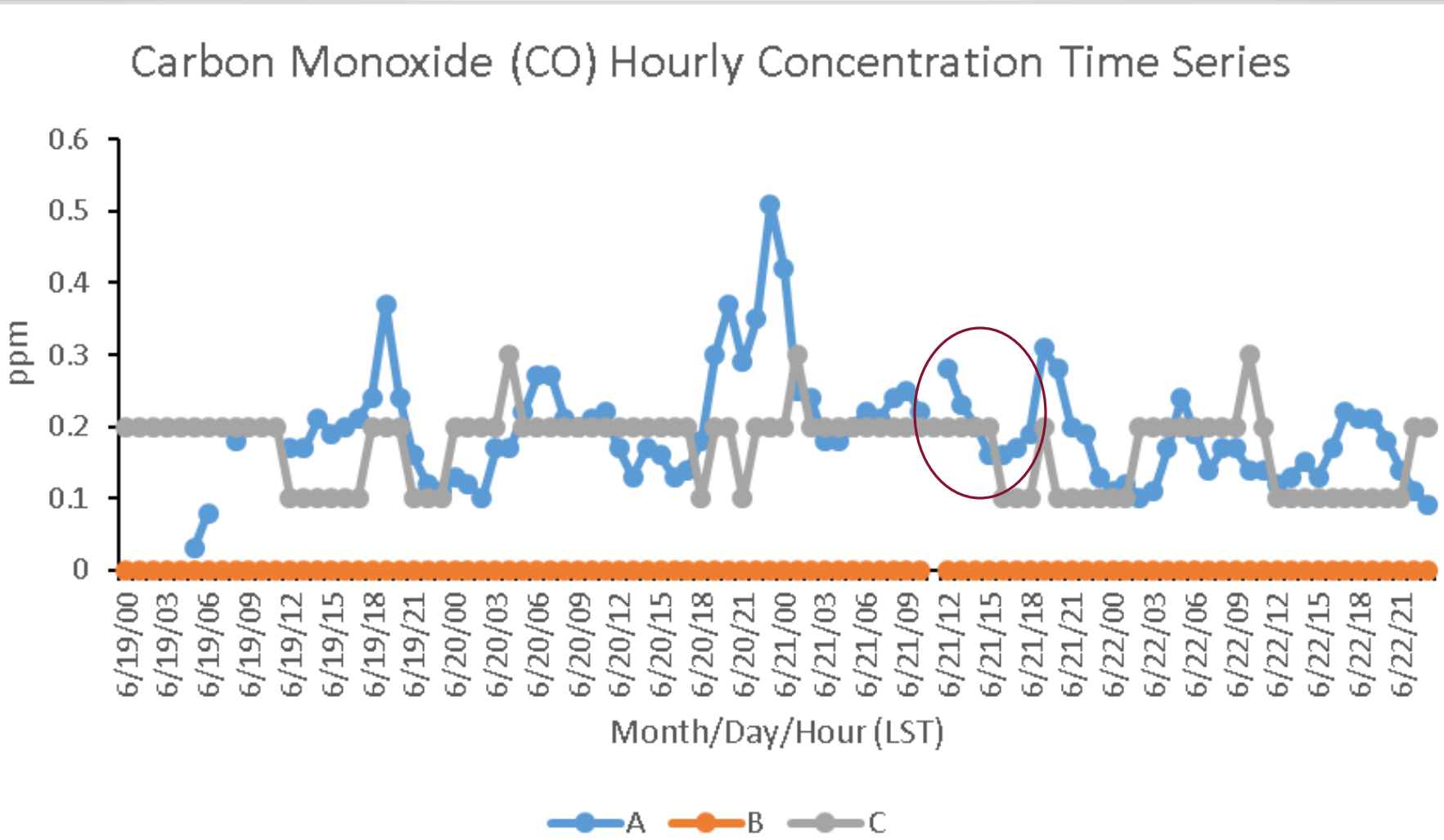
6/21/06
6/21/09
6/21/12
6/21/15
6/21/18
6/21/21
6/22/00
6/22/03
6/22/06
6/22/09
6/22/12
6/22/15
6/22/18
6/22/21
Month/Day/Hour (LST)
A
B
C


Carbon Monoxide (CO) Hourly Concentration Time Series
ppm
0.6
0.5
0.4
0.3
0.2
0.1
0
6/19/00
6/19/03
6/19/06
6/19/09
6/19/12
6/19/15
6/19/18
6/19/21
6/20/00
6/20/03
6/20/06
6/20/09
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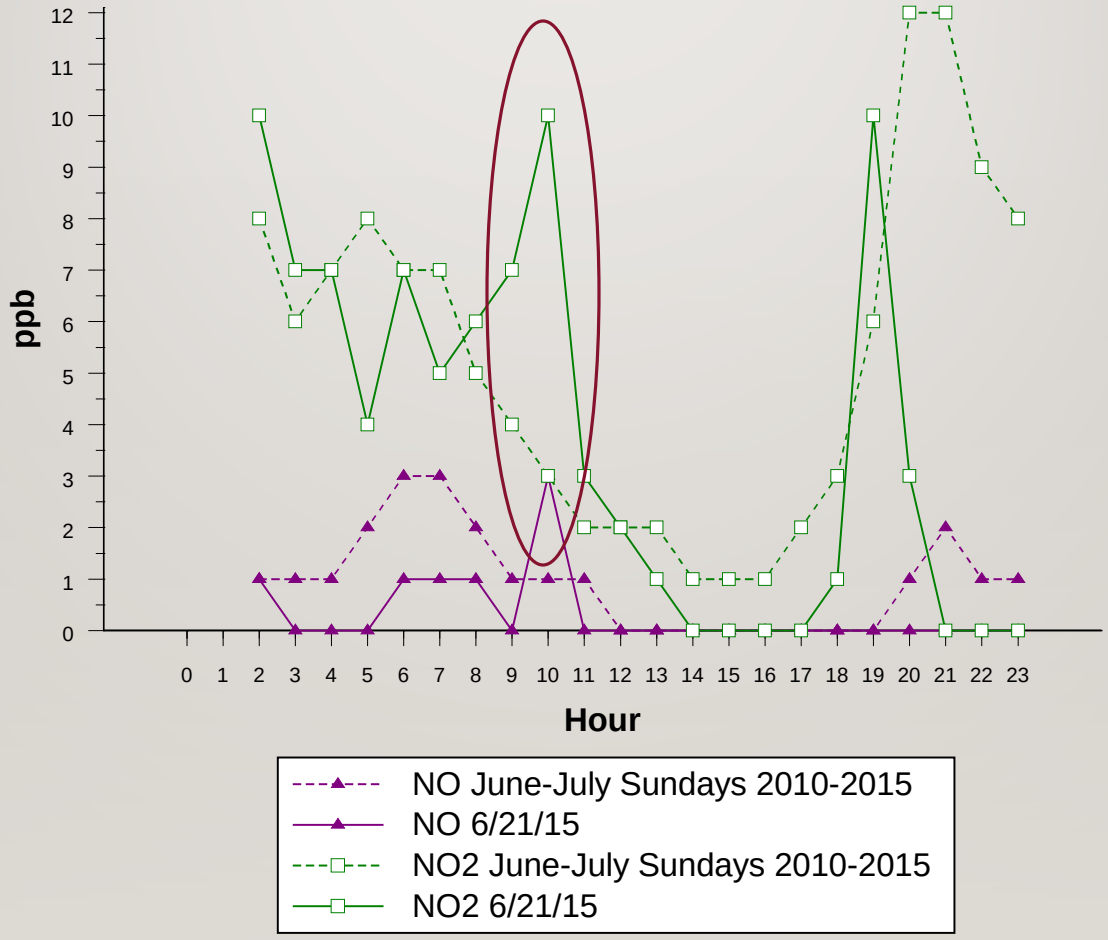
6/21/15
6/21/18
6/21/21
6/22/00
6/22/03
6/22/06
6/22/09
6/22/12
6/22/15
6/22/18
6/22/21
Month/Day/Hour (LST)
A
B
C

Example Site NO/NO2 Diurnal Profile Comparisons



FINAL THOUGHTS

- **If a long distance wildfire plume contained any ozone or precursor concentrations available to mix down to the ground-level, and if those concentrations actually mixed down to the ground-level, those concentrations would be expected to mix down broadly to all area monitors, resulting in concentration enhancements at all area monitors.**

- **Check the Q/D ratio of a wildfire. From page 17 of September, 2016 Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations: "The O_3 values within the approved demonstrations generally were associated with Q/D values above 50 tpd/km…The largest O_3 impacts from the modeling studies of the two largest fires (Wallow and Flint Hills fires) were associated with Q/D values above 100 tpd/km."**

Final Exceptional Events Rule Revisions and Final Wildfire/Ozone Implementation Guidance

US EPA

Office of Air Quality Planning and Standards

September 2016

Overview

- Key Points
- Background
- Final Exceptional Events Rule Revisions
- Exceptional Events Schedule in the 2015 Ozone National Ambient Air Quality Standards (NAAQS)
- Final Wildfire/Ozone Exceptional Events Implementation Guidance
- Next Steps
- Available Resources
- Questions and Discussion

Key Points

- EPA initiated the Exceptional Events Rule revisions and guidance development process to address certain substantive issues raised by state, local and tribal co-regulators and other stakeholders since promulgation of the 2007 rule and to increase the clarity and efficiency of the Exceptional Events Rule criteria and process.

- The exceptional events improvement efforts over the past several years have been collaborative involving multiple public webinars, listening sessions, meetings, best practices discussions and a public hearing in December 2015.

- The Exceptional Events Rule revisions and related guidance are key mechanisms in implementing the 2015 Ozone NAAQS.

- The effective date of the rule is September 30, 2016.

Background

- November 2015 - Notice of Proposed Rulemaking for rule revisions and Notice of Availability for draft guidance (80 FR 72840)
- December 8, 2015 – Public hearing in Phoenix, Arizona
- February 3, 2016 – Close of comment period
- September 16, 2016 – Administrator signed final Exceptional Events Rule revisions. OAQPS Office Director signed final wildfire/ozone guidance.
- September 30, 2016 – Rule effective date; posted to Federal Register Public Inspection site.
- October 3, 2016 – Publication in the Federal Register

General Exceptional Events Rule Background

- Elements of the Exceptional Events Rule
  - Applies to all criteria pollutants and NAAQS and all event types to which the rule applies
  - Applies to all state air agencies, to (delegated) local air agencies, to tribal air agencies that operate air quality monitors that produce regulatory data and to federal land managers/federal agencies if agreed by the state
  - Establishes procedures and criteria for identifying and evaluating air quality monitoring data affected by exceptional events
  - Provides a mechanism by which air quality data can be excluded from regulatory decisions and actions
  - Affects design value calculations, NAAQS designation decisions, attainment determinations, and State / Tribal / Federal Implementation Plan (SIP/FIP/TIP) development

Final Exceptional Events Rule Revisions

(Note: changes from proposal indicated by underline)

- Clarify the types of determinations and actions to which the authorizing statutory authority in Clean Air Act (CAA) section 319(b) applies
  - Designations / Redesignations
  - Classifications
  - Attainment determinations (including clean data determinations)
  - Attainment date extensions
  - Findings of SIP inadequacy leading to SIP call
  - <u>Other actions on a case-by-case basis</u>
- Return to the core statutory elements of CAA section 319(b)
  - The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation (as supported by a comparison of the of the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times);
  - The event was not reasonably controllable and the event was not reasonably preventable; and
  - The event was a human activity that is unlikely to recur at a particular location or was a natural event.

Final Exceptional Events Rule Revisions

- Clarify "not reasonably controllable or preventable" criteria
  - Clarify that "controllable" and "preventable" are separate tests
  - Rely on pollutant-relevant controls in attainment/maintenance SIP/FIP/TIPs approved within 5 years of the date of the event
  - Indicate that air agencies generally have no obligation to specifically address controls for emissions originating outside their jurisdictional (*i.e.*, state/tribal/international) border(s)
- Clarify high wind elements currently addressed in guidance
  - Include provisions for the high wind threshold
  - Include provisions and criteria for "extreme" events
- Codify requirements for the content and organization of exceptional events submittals
  - Make initial notification by the state to the EPA of a potential exceptional event a required (but waivable) preliminary step before submitting a demonstration (based on best practices)
  - Include narrative conceptual model
  - Address 3 core statutory elements (*i.e.*, clear causal relationship supported by comparison to historical concentrations, human activity unlikely to recur/natural event, not reasonably controllable or preventable)
  - Include documentation that public comment process was conducted

Final Exceptional Events Rule Revisions

- Remove “general schedule” deadlines for data flagging and demonstration submittal
- New fire-related rule language and preamble text
  - Clarify that all wildfires on wildland are natural events
  - Clarify that prescribed fire is a human-caused event eligible for treatment as an exceptional event and provide a streamlined path to show how air agencies can satisfy rule criteria
    - Rely on land/resource management plans (for frequency of recurrence and for “not reasonably preventable”)
    - Identify recommended components of Smoke Management Programs (in preamble) and Basic Smoke Management Practices (BSMP) (in rule text)
    - Require land managers, burn managers and air agencies to collaborate regarding the process by which the agencies will work together to include general expectations for selection and application of appropriate BSMP (2-year phase in period)
  - Define fire-related terms in regulatory language (prescribed fire, wildfire, wildland)

Final Exceptional Events Rule Revisions

- Mitigation Regulatory Requirements
  - Preamble identifies areas with recurring events (generally three events in a 3-year time period, which for final rule purposes was 1/1/13 – 12/31/15)
  - Requires development of mitigation plan (elements are specified) to be prepared and submitted for EPA's review
  - Identified areas have 2 years from the effective date of the rule to submit after which time the EPA will not concur with demonstrations for events that are the focus of the mitigation plan
- Other provisions
  - Address who may submit a demonstration
    - States and Tribes operating monitors that produce regulatory data
    - Local agencies with delegated responsibility for air quality management
    - Federal land managers with the concurrence of the affected air agency
  - Event aggregation
  - Preamble includes intended timelines for EPA response

Exceptional Events Schedule in 2015 Ozone NAAQS

- Developed flagging and demonstration submission rule language that specifies the schedule that would apply to any future NAAQS revision. (Dates are calculated based on the promulgation date of the NAAQS.)
- Promulgated schedule splits available time between the air agencies and the EPA and ensures that EPA has time to assess any exceptional events demonstrations that would substantively affect initial area designations
- For the 2015 Ozone NAAQS, the relevant data years include:
  - 2014-2016 for ozone designations promulgated in October 2017 (CAA 2-year schedule)
  - 2017 data - only if designations are completed under a 3-year schedule
- 2015 Ozone NAAQS established demonstration submission deadlines as follows:
  - ~~October 1, 2016~~ November 29, 2016 (for 2013 - 2015 data)
  - May 31, 2017 (for 2016 data)
  - May 31, 2018 (for 2017 data)
- The final Exceptional Events Rule revisions retain the same schedule that we promulgated in the 2015 Ozone NAAQS, but extend by 60 days (from the effective date of the Exceptional Events Rule) the demonstration submission schedule for demonstrations for 2013-2015
- Designation recommendations still due on October 1, 2016

Final Wildfire/Ozone Exceptional Events Implementation Guidance

- Full document name: *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations*

- What does the final guidance do?
  - Incorporates and applies the Exceptional Events Rule revisions to wildfire/ozone events
  - Provides example analyses, conclusion statements, and technical tools that air agencies can use to provide evidence that the wildfire event influenced the monitored ozone concentration

Final Wildfire/Ozone Exceptional Events Implementation Guidance

- Uses a tiered approach for analyses to support the clear causal relationship criterion
  - Tier 1 clear causal analyses
    - Appropriate when wildfire influences on ozone concentrations are clearly higher than non-event-related concentrations or occur outside of the area's normal photochemical ozone season
    - Use time series plots and evidence of transport to the monitor
  - Tier 2 clear causal analyses
    - Appropriate when the influences of the wildfire on ozone levels are higher than non-event-related concentrations and when fire emissions compared to the distance of the fire from the affected monitor indicate a clear causal relationship
    - Use Q/D (emissions/distance) screening criterion, threshold-based monitored concentrations and evidence of transport to and influence at the monitor
  - Tier 3 clear causal analyses
    - Appropriate when Tier 1 or Tier 2 analyses are not conclusive
    - Additional analyses that supplement Tier 1 and Tier 2 analyses
  - Appropriate tier to be determined by the EPA Regional office with the affected air agency during the "Initial Notification" discussions

Final Wildfire/Ozone Exceptional Events Implementation Guidance

- Tier 2 Key Factors
  - Q/D greater than or equal to 100 tons per day/kilometer
    - The guidance provides a detailed explanation of calculating emissions over distance
    - The guidance provides an example of how to aggregate multiple individual fires
  - A comparison to non-event related high ozone concentrations.
    - The event is in the 99th or higher percentile of the 5-year distribution of ozone monitoring data, OR
    - is one of the four highest ozone concentrations within 1 year (among those concentrations that have not already been excluded under the Exceptional Events Rule, if any)

Next Steps

- Additional Program Elements
  - Continued development of exceptional events tools (*e.g.*, website, templates, tools)
  - Revisions to *Interim Exceptional Events Guidance Documents*
  - Stratospheric Ozone Intrusion Guidance
  - Alternate Paths for Data Exclusion Guidance
  - Prescribed Fire Guidance
- Communication and outreach
  - Public outreach webinar (September 21)
  - Continued internal EPA coordination

Available Resources

- Exceptional Events Website at http://www2.epa.gov/air-quality-analysis/treatment-data-influenced-exceptional-events
  - Select “Exceptional Events Rule and Guidance” link on main page
  - Documents page contains:
    - Pre-publication copy of final rule
    - Final wildfire/ozone guidance
    - Response to comments document
    - Fact sheets
    - 2015 proposed rule documents
    - 2013 interim guidance documents
- EPA Regional office staff and/or EPA Office of Air Quality Planning and Standards staff
  - Beth Palma (palma.elizabeth@epa.gov)
  - Lev Gabrilovich (gabrilovich.lev@epa.gov)
  - Mark Evangelista (evangelista.mark@epa.gov)

Questions and Discussion

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Final Exceptional Events Rule Revisions

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  - Preamble identifies areas with recurring events (generally three events in a 3-year time period, which for final rule purposes was 1/1/13 – 12/31/15)
  - Requires development of mitigation plan (elements are specified) to be prepared and submitted for EPA's review
  - Identified areas have 2 years from the effective date of the rule to submit after which time the EPA will not concur with demonstrations for events that are the focus of the mitigation plan
- Other provisions
  - Address who may submit a demonstration
    - States and Tribes operating monitors that produce regulatory data
    - Local agencies with delegated responsibility for air quality management
    - Federal land managers with the concurrence of the affected air agency
  - Event aggregation
  - Preamble includes intended timelines for EPA response

Exceptional Events Schedule in 2015 Ozone NAAQS

- Developed flagging and demonstration submission rule language that specifies the schedule that would apply to any future NAAQS revision. (Dates are calculated based on the promulgation date of the NAAQS.)
- Promulgated schedule splits available time between the air agencies and the EPA and ensures that EPA has time to assess any exceptional events demonstrations that would substantively affect initial area designations
- For the 2015 Ozone NAAQS, the relevant data years include:
  - 2014-2016 for ozone designations promulgated in October 2017 (CAA 2-year schedule)
  - 2017 data - only if designations are completed under a 3-year schedule
- 2015 Ozone NAAQS established demonstration submission deadlines as follows:
  - ~~October 1, 2016~~ November 28, 2016 (anticipated) (for 2013 - 2015 data)
  - May 31, 2017 (for 2016 data)
  - May 31, 2018 (for 2017 data)
- The final Exceptional Events Rule revisions retain the same schedule that we promulgated in the 2015 Ozone NAAQS, but extend by 60 days (from the effective date of the Exceptional Events Rule) the demonstration submission schedule for demonstrations for 2013-2015
- Designation recommendations still due on October 1, 2016

Final Wildfire/Ozone Exceptional Events Implementation Guidance

- Full document name: *Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations*

- What does the final guidance do?
  - Incorporates and applies the Exceptional Events Rule revisions to wildfire/ozone events
  - Provides example analyses, conclusion statements, and technical tools that air agencies can use to provide evidence that the wildfire event influenced the monitored ozone concentration

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  - Tier 1 clear causal analyses
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- Tier 2 Key Factors
  - Q/D greater than or equal to 100 tons per day/kilometer
    - The guidance provides a detailed explanation of calculating emissions over distance
    - The guidance provides an example of how to aggregate multiple individual fires
  - A comparison to non-event related high ozone concentrations.
    - The event is in the 99th or higher percentile of the 5-year distribution of ozone monitoring data, OR
    - is one of the four highest ozone concentrations within 1 year (among those concentrations that have not already been excluded under the Exceptional Events Rule, if any)

Next Steps

- Additional Program Elements
  - Continued development of exceptional events tools (*e.g.*, website, templates, tools)
  - Revisions to *Interim Exceptional Events Guidance Documents*
  - Stratospheric Ozone Intrusion Guidance
  - Alternate Paths for Data Exclusion Guidance
  - Prescribed Fire Guidance
- Communication and outreach
  - Public outreach webinar (September 21)
  - Continued internal EPA coordination

Available Resources

- Exceptional Events Website at http://www2.epa.gov/air-quality-analysis/treatment-data-influenced-exceptional-events
  - Select “Exceptional Events Rule and Guidance” link on main page
  - Documents page contains:
    - Pre-publication copy of final rule
    - Final wildfire/ozone guidance
    - Response to comments document
    - Fact sheets
    - 2015 proposed rule documents
    - 2013 interim guidance documents
- EPA Regional office staff and/or EPA Office of Air Quality Planning and Standards staff
  - Beth Palma (palma.elizabeth@epa.gov)
  - Lev Gabrilovich (gabrilovich.lev@epa.gov)
  - Mark Evangelista (evangelista.mark@epa.gov)

Questions and Discussion

Exceptional Events Rule Update

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Office of Air Quality Planning and Standards
U.S. EPA, Office of Air and Radiation

Second International Smoke Symposium Workshop
November 14, 2016
Long Beach, California

Exceptional Events

- Exceptional Events Rule Revisions and Wildfire Guidance Development
  - November 20, 2015 – publication of proposed rule in in Federal Register (80 FR 72840)
  - December 8, 2015 – public hearing in Phoenix, Arizona
  - February 3, 2016 – close of comment period
  - September 30, 2016 – effective date of final Exceptional Events Rule
  - October 3, 2016 – publication in the Federal Register (81 FR 68216)

- Communication and Outreach
  - Webinars
  - Ongoing development of exceptional events tools (e.g., website, templates)
  - Continued internal coordination within EPA

General Exceptional Events Rule Background

- Provides a mechanism by which air quality data can be excluded from regulatory decisions and actions
- Affects design value calculations, NAAQS designation decisions, attainment determinations, and State / Tribal / Federal Implementation Plan (SIP/FIP/TIP) development
- Establishes procedures and criteria for identifying and evaluating air quality monitoring data affected by exceptional events
- Applies to all criteria pollutants and NAAQS and all event types to which the rule applies
- Applies to all state air agencies, to (delegated) local air agencies, to tribal air agencies that operate air quality monitors that produce regulatory data and to federal land managers/federal agencies if agreed by the state

Final Exceptional Events Rule Revisions

(Note: changes from proposal indicated by underline)

- Clarify the types of determinations and actions to which the authorizing statutory authority in Clean Air Act (CAA) section 319(b) applies
  - Designations / Redesignations
  - Classifications
  - Attainment determinations (including clean data determinations)
  - Attainment date extensions
  - Findings of SIP inadequacy leading to SIP call
  - <u>Other actions on a case-by-case basis</u>
- Return to the core statutory elements of CAA section 319(b)
  - The event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation (as supported by a comparison of the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times);
  - The event was not reasonably controllable and the event was not reasonably preventable; and
  - The event was a human activity that is unlikely to recur at a particular location or was a natural event.

Final Exceptional Events Rule Revisions (Cont'd)

- Clarify "not reasonably controllable or preventable" criteria
  - Clarify that "controllable" and "preventable" are separate tests
  - Rely on pollutant-relevant controls in attainment/maintenance SIP/FIP/TIPs approved within 5 years of the date of the event
  - Indicate that air agencies generally have no obligation to specifically address controls for emissions originating outside their jurisdictional (*i.e.*, state/tribal/international) border(s)
- Clarify high wind elements currently addressed in guidance
  - Include provisions for the high wind threshold
  - Include provisions and criteria for "extreme" events
- Codify requirements for the content and organization of exceptional events submittals
  - Make initial notification by the state to the EPA of a potential exceptional event a required (but waivable) preliminary step before submitting a demonstration (based on best practices)
  - Include narrative conceptual model
  - Address 3 core statutory elements (*i.e.*, clear causal relationship supported by comparison to historical concentrations, human activity unlikely to recur/natural event, not reasonably controllable or preventable)
  - Include documentation that public comment process was conducted
- Remove "general schedule" deadlines for data flagging and demonstration submittal

Final Exceptional Events Rule Revisions (Cont'd)

- Mitigation Regulatory Requirements
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Final Exceptional Events Rule Revisions (Cont'd)

- Fire-related rule language and preamble text
  - Define fire-related terms in regulatory language
    - » *Wildland* means an area in which human activity and development are essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.
    - » *Prescribed Fire* is any fire intentionally ignited by management actions in accordance with applicable laws, policies, and regulations to meet specific land or resource management objectives.
    - » *Wildfire* is any fire started by an unplanned ignition caused by lightning; volcanoes; other acts of nature; unauthorized activity; or accidental, human-caused actions, or a prescribed fire that has developed into a wildfire. A wildfire that predominantly occurs on wildland is a natural event.
  - Clarify that all wildfires on wildland are natural events
  - Clarify that prescribed fire on wildland is a human-caused event eligible for treatment as an exceptional event

Final Exceptional Events Rule Revisions (Cont'd)

- Provisions for prescribed fires
  - Language in preamble recognizes the need for and benefits of prescribed fire
  - Applying rule criteria to prescribed fires
    - *Clear causal relationship* – analyses similar to those for wildfires (see guidance)
    - *Human activity unlikely to recur* – recurrence is either the natural fire return interval OR the fire frequency needed to establish, restore and/or maintain a sustainable and resilient wildland ecosystem (as documented in a land/resource management plan)
    - *Not reasonably preventable* – incorporates concept of "foregone benefits" and uses same approach as unlikely to recur
    - *Not reasonably controllable* – fire conducted under a certified and implemented Smoke Management Program (SMP, see preamble) or using basic smoke management practices (BSMP, see rule text)

Final Exceptional Events Rule Revisions (Cont'd)

- Provisions for prescribed fires (cont'd)
  - Remove existing rule language requiring a state to re-consider adopting a SMP after each exceptional event
  - Require land managers, burn managers and air agencies to collaborate regarding the process by which the agencies will work together to include general expectations for selection and application of appropriate BSMP (2-year phase in period)
- Land/resource management plans and exceptional events
  - Can be relied upon to address recurrence and not reasonably preventable
  - Requirements apply equally to federal, public and private landowners

Final Exceptional Events Rule Revisions (Cont'd)

- Prescribed fire recurrence
  - Different for prescribed fire on wildland and other event types
  - Different for "unlikely to recur" and trigger for mitigation plan development
- Fire roles and responsibilities
  - Burn manager/agency can provide fire-specific information (e.g., emissions, acres burned, meteorology, modeling, communication and outreach, etc.)
  - Air agency and/or FLM can assess regulatory significance and the usefulness of getting EPA approval for data exclusion
  - Air agency and/or FLM can prepare the technical demonstration, which involves several data gathering and analysis tasks (EPA strongly encourages air agency and land manager collaboration and leveraging of resources and expertise)
  - Air agency is responsible for initial notification to EPA (can be delegated to FLM), deciding (with EPA input) whether to submit a demonstration, and submitting the prepared demonstration and/or endorsing the FLM's submission

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- EPA Regional Office Staff

EPA
United States
Environmental Protection
Agency

Questions and Comments

NAAQS Implementation and Nonattainment Area Requirements

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U.S. EPA, Office of Air and Radiation

Second International Smoke Symposium Workshop
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Once a NAAQS is Revised…

- ***Designations –*** Within 2 years of promulgating a new or revised national ambient air quality standard (NAAQS), the Clean Air Act (CAA) requires EPA to designate all areas of the country (including Indian country) as to whether the areas are meeting or not meeting that NAAQS (this effort is known as the initial area designations process)
  - Where insufficient information exists, the EPA may take an additional year for designations
- ***State Implementation Plan (SIP) Development*** – A state may need to prepare and submit a SIP revision to EPA for approval (e.g., states with a "nonattainment area" must prepare an "attainment plan SIP")
- ***Conformity of Federal Actions***
  - Highway funding and approvals (Transportation Conformity).
  - Any other action or approval by a federal agency in the nonattainment area (General Conformity)

Anticipated NAAQS Implementation Milestones for Ozone and $PM_{2.5}$

Pollutant	Date of NAAQS	Designations Effective	Attainment Plans Due	Attainment Date
$PM_{2.5}$ (2006, 24-hour) **16 Nonattainment Areas**	Oct 2006	Dec 2009	Dec 2014	Dec 2015 (Moderate) Dec 2019 (Serious)
Ozone (2008, 75 ppb) **43 Nonattainment Areas**	Mar 2008	July 2012	Mid 2015-2016	Mid 2015-2032
$PM_{2.5}$ (2012, annual) **9 Nonattainment Areas**	Dec 2012	Apr 2015	Oct 2016 (Moderate)	Dec 2021 (Moderate) Dec 2025 (Serious)
Ozone (2015, 70 ppb) **No designations yet**	Oct 2015	*Dec 2017*	*Dec 2020-2021*	*2020-2037*

Designations

- Designations for ozone and PM NAAQS are based on ambient monitoring data
  - EPA generally uses the three most recent years of quality-assured air quality monitoring data for designations
- Data affected by “exceptional events” can be excluded with EPA approval
- Designation Categories for PM and ozone
  - **Nonattainment Area** – An area that that does not meet or that contributes to a nearby area that does not meet the NAAQS
  - **Attainment Area** – An area that is meeting the NAAQS and is not contributing to a nearby area that does not meet the NAAQS
  - **Unclassifiable Area** – An area that cannot be designated based on available information as meeting or not meeting the NAAQS
  - **Unclassifiable/Attainment** – Alternate category used by EPA, which includes areas with clean air quality and areas without monitoring data that are not contributing to a nearby area that does not meet the NAAQS
- Designations process includes identifying Nonattainment Area (and, in limited cases, Unclassifiable Area) boundaries
  - Remaining areas typically designated Unclassifiable/Attainment

Designations

- The CAA requires designations 2-3 years after NAAQS promulgation
- EPA also has discretionary authority to redesignate newly violating areas to nonattainent at any later time
- States and Tribes provide recommendations for designations to EPA
- EPA bases final designation decisions, including nonattainment area boundaries, on the state and tribal recommendations, any public comments received and on an evaluation of five factors:
  - **Air quality data** (e.g., monitoring data, does the area/county have a violating monitoring site?)
  - **Emissions and emissions-related data** (e.g., source emissions data, traffic and commuting patterns, population and degree of urbanization)
  - **Meteorology** (i.e., weather/transport patterns)
  - **Geography/topography** (i.e., physical features of the land that might affect the distribution of the pollutant or precursors over the area)
  - **Jurisdictional boundaries** (e.g., counties, air districts, existing nonattainment areas, townships, Indian country, metropolitan planning organizations)

Requirements for Nonattainment Area SIPs

- Required elements in the SIP include:
  - Emissions inventory of relevant pollutants
  - Control measures needed to attain the standard “as expeditiously as practicable”
  - A prospective, air quality modeling-based attainment demonstration showing that the NAAQS will be attained by the applicable future attainment date
  - A demonstration that there will be reasonable progress of emissions reductions toward attainment
  - Contingency measures to be implemented if the area fails to make adequate progress, or fails to attain by the attainment date
  - Nonattainment new source review program for new and modified major stationary sources. Requirements include Lowest Achievable Emission Rate controls and emissions offsets

The Attainment Demonstration and Smoke

- Generally, the modeling-based attainment demonstration relies on realistic projections of emissions in the year in which attainment must be achieved. These projections should consider:
  - Emissions reductions from the implementation of the nonattainment area control strategy
  - Reductions from existing federal and state regulations on the books
  - Projected growth and retirements for stationary sources
- Projecting future-year fire emissions
  - Most or all states have assumed a “flat trend” in fire emissions in their attainment demonstrations, despite the known variability and the recognized possibility of a long-trend towards more fires
  - EPA recently formally endorsed this approach, in the $PM_{2.5}$ SIP Requirements Rule. See 81 FR 58010 at 58038. (Note: EPA is taking a similar approach in the recently proposed 2015 Ozone SIP Requirements Rule.)
    - Applies to wildland wildfires and wildland prescribed fires
    - Does not apply to agricultural fires or to burning of slash from commercial logging

Considering Fire Impacts

- EPA supports the assumption of a flat trend in fire for a number of reasons, explained in the $PM_{2.5}$ SIP Requirement Rule
  - "Reasonably available control measures" in a SIP do not have to include measures to influence wildfires or to limit the use of prescribed fire
- EPA encourages states to think carefully about these questions:
  - How do wildfires affect ozone and $PM_{2.5}$ air quality?
  - How can reasonable use of prescribed fires influence the occurrence and impacts from wildfires?
  - How can impacts from prescribed fires be reasonably limited, for example by use of basic smoke management practices?
  - Who has information to help answer these questions?
  - What parties have a stake in these issues?

General Conformity

- General Conformity
  - Applies only for Federal agency actions (including funding and permitting) in nonattainment and maintenance areas and where emissions exceed threshold levels
  - Generally requires a demonstration that the Federal action's emissions do not cause or contribute to a NAAQS violation, increase the frequency or severity of a violation or delay timely attainment of a standard
  - Addressing emissions from Federal actions could involve:
    - Including these emissions in a SIP
    - Offsetting emission reductions
    - Modeling to demonstrate that the emissions do not cause or contribute to a violation
  - Provides two additional flexibilities for prescribed fires
    - Emissions from fires conducted in accordance with a Smoke Management Program that meets the requirement of the Interim Fire Policy or an equivalent EPA policy are exempt
    - The FLM can determine that fires of a given type that use basic smoke management practices are "presumed to conform" based on technical or historic data for all future prescribed burns of that type. (Requires public notice and comment before a practice is added to list of those practices presumed to conform.)
  - Each Federal agency is responsible for determining general conformity.
  - No current plan for EPA to revise the general conformity rules, which were last revised in 2010

What Do the Nonattainment Requirements Mean for You?

- States are concerned that smoke may cause an area to violate the ozone or $PM_{2.5}$ NAAQS and lead to a formal "nonattainment" designation
  - The Exceptional Events Rule can make a difference
- EPA regulations and guidance provide reasonable, streamlined options for managing the air quality impacts of wildfires and prescribed fires on wildland
- Parties other than EPA will decide what is reasonable to do in each area with fire issues, but EPA will participate, as needed, in these discussions
- Federal agencies igniting prescribed fires need to "conform" to any applicable SIPs and/or comply with state/local requirements and document their actions